Technical Specification
Parking Revenue Control System (PRCS)

December 14th, 2009

METROPOLITAN WASHINGTON
AIRPORTS AUTHORITY

Control Information

Document Location

File Name	Technical Specification Parking Revenue Control System (PRCS)

Change Control

Version	Date	Author	Change Description
1.0	June 1, 2009	Booz Allen	Internal version
2.0	June 15, 2009	Booz Allen	Changed based on input from Authority
3.0	July 23, 2009	Booz Allen	Implemented comments from the Authority, Subs and Booz Allen
4.0	July 31, 2009	Booz Allen	Implemented comments from workshop
5.0	November 9, 2009	Booz Allen	Updated Appendix
6.0	December 4, 2009	Booz Allen	Final comments added based on industry review

TABLE OF CONTENTS

Section **Page**

ABBREVIATIONS **6**
1. GENERAL SCOPE OF WORK **8**
1.1 PROJECT OVERVIEW **8**
1.2 ENVIRONMENTAL REQUIREMENTS **10**
1.3 INTERFACES **11**
1.4 CODE REQUIREMENTS AND STANDARDS **11**
1.5 COUNT DEFINITIONS **12**
2. PRCS EQUIPMENT **12**
2.1 ENTRY EQUIPMENT **12**
2.1.1 Entry Station 12
2.1.2 Barriers 16
2.1.3 Patron Processing 17
2.1.4 Entry Lane Logic 18
2.2 EXIT EQUIPMENT **19**
2.2.1 Exit Stations 19
2.2.2 Barriers 21
2.2.3 Vehicle Detection Exit 21
2.2.4 Patron Processing 22
2.2.5 Cash Payment at Cashier 24
2.2.6 Magnetic Strip Credit/Debit Card Payment 25
2.2.7 Contactless Credit/Debit Card Payment 25
2.2.8 Credit/Debit Card Exception Exit 25
2.2.9 Exception Transactions 26
2.2.10 Receipt Printing 30
2.3 CENTRAL DATA MANAGEMENT SYSTEM **32**
2.3.1 PRCS' Integration with ERP 32
2.3.2 General Requirements 32
2.3.3 System Requirements 33
2.3.4 PRCS Network Management 34
2.3.5 Data Storage Capacity 34
2.3.6 System Performance 35
2.3.7 Maintainability Requirements 37
2.3.8 System Hardware 37
2.3.9 Software Requirements 38
2.3.10 Central Data Management System Security 38
2.3.11 Communications Infrastructure 40
2.3.12 Reporting Requirements 40
2.3.13 Auditing and Revenue Control Requirements 48
2.4 SPACE COUNT SYSTEM **52**
2.4.1 General Requirements 52
2.4.2 Software Requirements 53
2.4.3 Workstation Functions 53
2.4.4 Design Requirements 54
2.4.5 Operational Procedures 54
2.4.6 Parking Space Count Signs 55
2.4.7 Parking SCS Provisions 56
2.5 LICENCE PLATE RECOGNITION AND INVENTORY REQUIREMENTS **56**
2.5.1 Cashier Terminal 56
2.6 LICENCE PLATE INVENTORY SYSTEM **60**

2.6.1 General Requirements 61
2.6.2 Inventory Device Functional Requirements 61
2.6.3 LPI Process 62
2.7 LICENCE PLATE RECOGNITION 63
2.7.1 LPR System Overview 63
2.7.2 LPR Subsystem General Layout 63
2.7.3 Credit Card In / Credit Card Out LPR Integration 64
2.7.4 Unique Features and Requirements 65
2.7.5 LPR Subsystem Hardware 65
2.7.6 LPR Subsystem Software 67
2.7.7 LPR Subsystem Testing 68
2.7.8 LPR Subsystem Performance Requirement 68
2.7.9 Technical Support Response Requirements 69
2.8 LPR OPTIONS 69
2.8.1 Longterm LPR Maintenance Agreement 69
2.8.2 LPR Equipment Per Lane Unit Price 69
2.8.3 LPR Audit System 70
2.9 SPACE MANAGEMENT SYSTEM (OPTION) 70
2.10 SYSTEM CONFIGURATION 71
3. PROJECT SUPPORT 72
3.1 PROJECT MANAGEMENT 72
3.1.1 Project Management Scope 72
3.1.2 Program Requirements 72
3.1.3 Project Meetings 74
3.2 DESIGN REVIEW 76
3.2.1 System Configuration Management (SCM) 76
3.2.2 Design Review Process 77
3.2.3 Conceptual Design Review (CDR) 78
3.2.4 Preliminary Design Review (PDR) 78
3.2.5 Final Design Review (FDR) 79
3.2.6 Drawing Requirements 80
3.3 TESTING 80
3.3.1 Inspection and Testing Program 80
3.4 TRAINING 84
3.4.1 Training Guidelines 85
3.5 WARRANTY 88
3.5.1 Warranty Coverage 88
3.5.2 Warranty Period 88
3.5.3 Remedial Work 88
3.5.4 Warranty Conditions 88
3.5.5 Negligence 89
3.5.6 Consummable Items 89
3.5.7 Fleet Defects 89
3.5.8 Warranty Personnel 89
3.5.9 Warranty Repair Agreement 90
3.6 QUALITY ASSURANCE (QA) AND QUALITY CONTROL (QC) 91
3.6.1 Contractor's QA Program Plan 91
3.7 INSTALLATION 91
3.7.1 Installation Phasing 92
3.7.2 Office Layouts 92
3.7.3 Removal and Disposal of Existing Equipment 93
3.7.4 General Physical Requirements 93
3.8 DOCUMENTATION 95
3.8.1 Manual Submissions 97
3.8.2 Revisions 97

3.8.3 Content Requirements 97
4. SERVICES 100
4.1 TECHNICAL SUPPORT 100
4.2 MAINTENANCE 100
4.2.1 Maintenance Provider 102
4.2.2 Preventive Maintenance Schedule 102
4.2.3 Response Time – Corrective/Repair Services during Warranty Period 103
4.2.4 Maintenance Log 103
4.2.5 Spare Componenets and Parts Replenishment 104
4.2.6 Maintenance Agreement 105
4.2.7 Software Upgrades 106
4.2.8 Maintenance Support Reporting 106
4.3 PRCS MAINTENANCE REPORTING 107
4.3.1 Maintenance Reporting Function 107
4.3.2 Maintenance Plan 108

TABLES

1-1 Summary of Airport Parking Spaces
1-2 Summary of Parking Lanes By Type
1-3 Environmental Conditions
1-4 LCD Minimum Requirements
2-1 LED Minimum Requirements
2-2 Patron Fee Indicator Minimum Specifications
2-3 System Performance Levels
2-4 Transactional Time Requirements for all Non-Human Related Factors
3-1 List of Training Courses and Participants

APPENDIX

A Milestone Payments
B Site Survey
C Interface Specification
D Message Sign Interface Document
E Automated Vehicle Identification (AVI) Interface Document
F Proposed High-Level Architecture Diagram
G Contract Data Requirements List (CDRL)
H Existing PRCS Network Infrastructure Diagram

ABBREVIATIONS

ADA	Americans With Disabilities Act
CDR	Conceptual Design Review
CDRL	Contract Deliverable Requirements List
CF	Confidence Factor
COTS	Commercial Off-The-Shelf
CPI	Consumer Price Index
DTE	Diagnostic and Test Equipment
EIA	Electronic Industries Alliance
EMI	Electromagnetic Interference
EML	Electronic Maintenance Log
ERP	Enterprise Resource Planning
FAT	Factory Acceptance Test
FDR	Final Design Review
GUI	Graphical User Interface
IP	Internet Protocol
IRWS	Image Review Work Station
ISF	Insufficient Funds
ISO	International Standards Organization
LCD	Liquid Crystal Display
LCIP	Lane Control And Interface Processor
LED	Light-Emitting Diode
LLRC	Lowest Level Replaceable Component
LLRU	Lowest Level Replaceable Unit
LPI	License Plate Inventory
LPN	License Plate Number
LPR	License Plate Recognition
MTBF	Mean Time Between Failures
NEC	National Electrical Code
NMT	Network Management Terminal
NTP	Notice To Proceed
OSHA	Occupational Safety and Health Administration
OSI	Open System Interconnection
PCI DSS	Payment Card Industry Data Security Standards
PDF	Portable Document File
PDR	Preliminary Design Review
PRCS	Parking Revenue Control System
RFI	Radio Frequency Interference
QA	Quality Assurance

QC	Quality Control
SCM	System Configuration Management
SCS	Space Count System
SNMP	Simple Network Management Protocol
TCM	Transactional Complete Message
UCD	Universal Card Device
VLAN	Virtual Local Area Network

1. GENERAL SCOPE OF WORK

1.1 PROJECT OVERVIEW

The Metropolitan Washington Airports Authority (Authority) is the owner of all parking operations associated with this contract. For purposes of this contract, the Ronald Reagan Washington National Airport's (Airport) parking system is summarized in Tables 1-1 and 1-2. Table 1-1 summarizes each parking facility's type and number of spaces and Table 1-2 summarizes each parking facility's lane count by type.

Table 1-1: Summary of Airport Parking Spaces

Garage Name	Regular Spaces	Handicap Spaces	Current Total	Additional Spaces under Construction	Future Total
Garage A	872	18	**890**	581	**1471**
Garage B/C Daily	3877	52	**3929**	843	**4772**
Garage B/C Hourly	455	20	**475**	-	**475**
Economy	2956	40	**2996**	-	**2996**
Subtotal	**8160**	**130**	**8290**	**1424**	**9714**
Daily Lot A-1 Overflow	116	3	**119**	-	**119**
Satellite Overflow	822	22	**844**	-	**844**
Cell Phone	33	0	**33**	-	**33**
Grand Total	**9131**	**155**	**9286**	**1424**	**10710**

Table 1-2: Summary of Parking Lanes by Type

Entrances	Entry Lanes	Exit Lanes
Garage A	2	2
Garage B/C	8	9
Economy Lot	2	2
Total Entrances	**12**	**13**

The scope of work for the new Parking Revenue Control System (PRCS) includes the following functionality and features:

1) The Authority's replacement PRCS shall be characterized as a fully on-line, real-time, open-architecture system using slot technology at entry lanes,

cashiered and automated exit lanes.

2) The PRCS shall operate from fully fault-tolerant equipment. Data and audio communication between the field locations, e.g., the entry stations and the exit stations, to the Central Data Management System (CDMS) shall be via fiber optic cable in a point-to-point configuration using an industry standard communications protocol (RS232, Ethernet, etc). The Contractor shall submit final communications protocol configuration for review and approval by the Authority. Electrostatic forces within the environment, e.g., lightning strikes, or other types of power interference shall have no effect upon the integrity of the PRCS. The Contractor shall provide lightning protection and telecommunications grounding to protect sensitive electronic equipment.

3) Communication between the PRCS central server and the Authority's network shall be implemented using a minimum 10/100 Base-TX Ethernet. It is the Authority's intention to have the PRCS use the Authority's LAN for communications. At the Authority's discretion, the PRCS may be placed on a separate Virtual Local Area Network (VLAN) with appropriate communication ties to the existing Authority Administrative LAN. The Authority shall provide Internet Protocol (IP) addressing schemes. The communications infrastructure requirements and services shall be defined by the Contractor and submitted for written approval by the Authority.

4) All credit and debit card acceptance hardware and software shall be Payment Card Industry Data Security Standard (PCI DSS) compliant and listed on the PCI Security Standards Council's list of Approved PIN Entry Devices. All applications that store, process or transmit credit card information as defined by the PCI Security Standards Council will appear on the PCI Security Standards Council's list of Validated Payment Applications listed at www.pcisecuritystandards.org/security_standards/vpa.

5) All hardware and software required to meet credit, debit and contactless card acceptance functionality supplied by the Contractor shall be PCI DSS certified through an independent third party authorized by a professional organization to conduct such activities. The Authority's preference is for a third party to process and store all credit and debit card related information in a secure offsite location and that no credit card data is stored on Authority servers.

6) All hardware and software configuration settings, processes (both manual and automated), policies, procedures, reports, network architecture, data storage schemes and other products resulting from this specification shall comply with the PCI Security Standards Council Data Security Standard (PCI-DSS).

7) Communication between the PRCS central server and the Authority's network shall be implemented where business needs require it. If any credit card data (as defined by the PCI Security Standards Council) is stored, processed or transmitted, the PRCS system and all endpoints (terminals, printers, lane equipment, etc.) shall be established on an independent network separated from all other Authority networks by, at minimum, a properly configured firewall.

8) The PRCS transactional stream of data shall be compiled in a SQL/ODBC compliant database that easily converts the data into common spreadsheet and database formats. The Authority shall have the ability to prepare new reports or revise the Contractor-provided reports as the Authority's reporting standards change and/or are expanded.

9) The PRCS shall archive all transactional data onto the data warehouse used by the Enterprise Resource Planning (ERP) system. Access to archived data shall be limited only to Authority staff that has access to the data in the transactional database. ERP access shall be based on their business rules related to access.

1.2 ENVIRONMENTAL REQUIREMENTS

Ronald Reagan Washington National Airport is located in northern Virginia approximately 23 miles east of the Blue Ridge Mountains. Low rolling hills near the airport, along with poor air drainage contribute to the formation of local ground fog. The Atlantic Ocean is 140 miles to the east with the Chesapeake Bay about 55 miles to the east. Washington, DC is approximately 25 miles to the east of the airport.

All installed equipped shall function correctly under the following conditions:

Table 1-3: Environmental Conditions

Ambient Temperatures	-30°F to 110°F
Humidity	0% to 95% (non-condensing)
Snow	Freezing snow and ice
Rain	Blowing rain with 30 mph gusts
Dust	Blowing dust and fine sand
RFI/EMI	Authority standard environment

Displays shall operate in all lighting conditions and shall not be adversely affected by exposure to outdoor elements.

Liquid Crystal Displays (LCDs) shall have the following minimum characteristics:

Table 1-4: LCD Minimum Requirements

Display Type	TFT/LCD active matrix color
Resolution	1024 x 768
Response Time	Tr=20ms/Tf=15ms
Contrast Ratio	300:1 typical
Brightness	250cd/m2typical
Pixel Patch	0.297mm (H) x 0.297mm (W)
Panel Color	16.7million display colors
Viewing Angle	170° (Horizontal)/170° (Vertical)
Operating Temperature	0°C to 50°C
Storage Temperature	-20°C to 60°C
MTBF	20,0 hours

Ticket and credit card insertion points on entry and exit devices shall be designed to prevent ice from blocking insertion points.

1.3 INTERFACES

All interfaces shall be based on open standards and protocols. Use of any proprietary interfaces shall be approved only by written authorization by the Authority. Once approved, the Contractor shall provide complete documentation of the proprietary interface for the use of the Authority.

The PRCS shall interface with the following systems:

1) Enterprise Resource Planning (ERP)
2) External Signs
3) EZ Pass (Future)

1.4 CODE REQUIREMENTS AND STANDARDS

Unless otherwise specified, all computerized parking control equipment components and ground transportation management equipment shall be new, free of defects, and installed in accordance with these design requirements.

The equipment components and their installation shall comply with all laws, ordinances, codes (e.g. OSHA, ADA, NEC), rules, and regulations of public authorities having jurisdiction over this part of the work. It shall be the responsibility of the Contractor to meet these and other current technical, performance, and safety standards that are applicable to all components and to the entire system, even when not specifically referenced.

The PRCS, when installed, must as a whole comply with the requirements of the Americans with Disabilities Act (ADA) and any Virginia and local jurisdiction requirements for accessibility and use by individuals with disabilities. The Contractor shall be responsible to determine which parts of the PRCS need to be ADA compliant. The Contractor shall provide the Authority an ADA compliance analysis report, CDRL 101.

1.5 COUNT DEFINTIONS

The following is summary of definitions on counts:

1. Mounted non-resettable counters on each device (entry station, exit station, cashier station, and barrier gate) that increments each time an event occurs. An event is a ticket dispensed, a card read, a payment received, a validated or grace period ticket processed, or a gate vend. (triggered by a transaction or a manual gate vend done locally or remotely).
2. Loop-based counts for the SCS – increments in system when loops are activated including directional logic for reverse (i.e. illegal) entry and exit. Loop counts continue when the PRCS is offline or when a gate remains up.

3. Transaction counts – each time an event occurs at a device the system increments a count.
   i. For an entry station this is the total counts as well as subtotals of tickets dispensed and access cards read in the entry lane reports. Transaction counts also appear in shift reports and detailed transaction reports.
   ii. For an exit station this is the total transactions processed and subtotals payments and access cards. Transaction counts also appear in shift reports and detail transaction reports.

2. PRCS EQUIPMENT

This section provides the requirements for the PRCS equipment and systems to be supplied by the Contractor. The Contractor shall supply the following:

1) Entry Equipment
2) Exit Equipment
3) License Plate Inventory (LPI)
4) License Plate Recognition (LPR)
5) Central Data Management System (CDMS)

2.1 ENTRY EQUIPMENT

2.1.1 Entry Station

Entry Stations shall be PC-based, push-button type devices that issue one credit card-sized, magnetic and/or barcode encoded tickets for each entry transaction with non-

resettable sequential ticket-issued counter, push-button-activated, ring-down intercom (intercom connection supplied by others), and retractable ticket mechanism. The tickets issued shall be multi-directional meaning they have the ability to be read when inserted in any direction. The entry stations shall transmit all transaction data in real-time to the PRCS central server and have the capacity to process transactions locally in the event of loss of communication. The Authority prefers bricks or fan-fold as the ticket format.

The specific parking area shall be identified at the time of printing. The Entry Station ticket slot shall also be capable of reading an International Standards Organization (ISO) standard side-stripe magnetically encoded or bar-coded card such as a credit/debit card and shall also be able to accept an ISO 14443 standard contactless card. All magnetic stripe or barcode ticketing and card reading shall be from a single slot in the Entry Station's face, i.e., single-slot technology.

The Entry Station shall provide the following functionality for counts:

1. Non-resettable mounted counter on Entry Station that increments each time an event (i.e. ticket dispensed, card read) occurs at the Entry Station
2. Non-resettable mounted counter on Barrier Gate that increments each time the gate is vended
3. Transactions counts located in system reports that identify the total number of transactions processed for a given time by the Entry Station and also provides counts for each transaction type (i.e. tickets, access cards)
4. Vehicle counts based on loop activity for reporting to the Space Count System. Non-resettable closing detection counter. Secured switch for activating/deactivating all lane equipment. LCIP to control equipment component communications within the lane and to the CDMS

2.1.1.1 Display

The Entry Station shall have a color, touch screen that is readable in all ambient lighting conditions. The entry station shall also have a counting mechanism for access card and credit/debit card entries (this shall be a system count, which are necessary for complete vehicle entry accountability).

The Entry Station shall also have LED (Light Emitting Diode) signs to indicate the status of the lot. LEDs shall meet the following minimum requirements:

Table 2-1: LED Minimum Requirements

Minimum Pixel Patch	11mm
Luminance	3000 cd/m^2 - 7000 cd/m^2
Colors Displayed	Monochrome – Red, Yellow, Green, Amber, and Blue Tri-Color – Total 16 color combination
MTBF	100,000 hours
Viewing Angle	Horizontal - 70°/Vertical - 35°
Working Environment	Outdoor rated. Temperature: -4°F to 140°F, Humidity: 15% — 95% RH
Communication Methods	RS232, RS422, or Ethernet (over copper or fiber)
Memory Retention	Over 1 year. Backup with CR cell battery, flash memory
Minimum Matrix Size	16 pixels high by 24 pixels wide

2.1.1.2 Operating Modes

The barrier gate shall have a maintenance mode where it is capable of being opened or closed only by maintenance personnel. Test mode shall allow a technician to test all functions of the lane. The lane may also be placed in a non-operational "closed" condition when desired by the Authority's operations staff, either remotely or locally. In this mode the lane is disabled, the gate remains closed, and the lane indicator displays a "red" status (i.e. closed). An override switch shall be provided to continue the "red" status display but not disable the equipment during servicing. Either the "green" or "red" indication shall be illuminated at any given time. The Authority's operation staff should be able to remotely command the vend gates. The PRCS system is required to record the date, location and user that vended the gate. This function must be easily extracted from the PRCS for auditing purposes.

An additional requirement is the ability to have non-resettable, sequential gate counters that are activated on each occurrence that a gate is raised. The count system can be applied using loops in addition to gate vends or transactions processed.

The Entry Station shall have local off-line capabilities in the event of a communications failure. The Entry Station shall store transactions and upload all transaction data to the appropriate processing system once communications is restored.

2.1.1.3 Vehicle Detection

Each lane shall be equipped with vehicle presence and direction loops. As a vehicle is driven into an entry lane, it shall pass over or into the Entry Station's dual detection loops A and B. When the vehicle is detected in the dual arming loops, the vehicle shall be in position for the driver to press the ticket issue button on the Entry Station's face. Only one transaction shall be granted for each vehicle as determined by the closing loop.

The detection loops shall have directional logic. Directional logic identifies loop patterns to detect stolen and backout tickets. As a vehicle approaches a lane it activates Loop A and then Loop B. The driver pulls a ticket and the gate opens. The vehicle drives over Loop C, the gate closes, and the ticket is recorded as a valid ticket in the system. This event has a loop pattern of A-B-C. If the vehicle backs out of the lane the loop pattern is A-B-B-A. When this loop sequence occurs the system shall void the ticket. The system shall also void a ticket that was dispensed when the vehicle backs out of the lane in an A-B-C-B-A loop pattern. This occurs when the driver takes a ticket, pulls the vehicle forward enough to activate Loop C and then backs outs of the lane.

2.1.1.4 Ticket and Card Processing

The Entry Station shall issue an encoded ticket, accept and read contactless access or credit/debit cards from the interface at the Entry Station. The entry station shall also accept ISO 14443 compliant contactless cards issued either by the Authority or a bank.

If the ticket issue button is first pressed, the Entry Station shall issue a sequentially numbered parking ticket while an audible signal shall sound. The Entry Station shall magnetically encode and print on the ticket the year, month, date, entry time (hour/minute/second), facility code, lane number, and entry sequence number. Abbreviations are acceptable; time stamps shall be in 24-hour, military time.

If a valid ISO standard contactless card, such as an issued access card or credit card, is brought into the range of the contactless reader or a credit/debit card is inserted in the Entry Station's ticket slot prior to pushing the Entry Station's push button, access for that vehicle will be permitted. In both cases the ticket dispenser will be disabled until reset by the activation of the closing loop C. Likewise, if a ticket has been dispensed due to a push-button authorization, contactless or magnetic stripe card shall not be accepted until reset by the activation of the closing loop C. The lane counters will increment separate count databases depending on the method of activation, i.e., besides a grand total count separate counts shall be maintained based on entry type (non-revenue access cards, tickets, etc.)

2.1.1.5 Ticket Issuance

1) Each ticket dispensed shall be assigned a unique, non-resettable identification number.
2) Each ticket dispenser shall have its own non-resettable sequence for tickets dispensed. Globally assigned ticket identification numbers is not acceptable.
3) Each entry station shall have a mounted non-resettable counter that will increment each time a ticket is dispensed.

4) The PRCS shall allow the user to track the ticket status for each ticket dispensed. The status will be open (meaning the ticket is dispensed but not used to exit) or closed (meaning the ticket was processed and used to exit).
5) The PRCS shall allow the user to filter and print all tickets within a selectable sequential identification number range.
6) The PRCS shall allow the user to filter and print all tickets by status (i.e open or closed) within a user defined date range.
7) The PRCS shall allow the user to filter and print all open tickets that are older than a user defined date.
8) The PRCS shall allow the user to close out old tickets. This action will require special user rights and will record the date the ticket was closed and the user id that closed the ticket. It will also identify the ticket as being manually closed out.
9) The PRCS shall allow the user to trace ticket activity from the time it is dispensed until it is paid and used at exit.
10) Man-readable characters printed on ticket for auditing. Same for exit stations and cashier terminals.
11) The vendor shall describe all possible ways to create a ticket in their PRCS.

2.1.1.6 Intercom System

Entry Lane Intercom – a push-button activated, ring-down intercom (intercom connection supplied by others) shall be available in the event a patron needs assistance while stopped in an entry lane. The patron needing assistance presses a "Call Attendant" button. The communications for the intercoms shall be directed to the designated parking office. The parking office shall be equipped with a console that displays the physical location of the intercom button pressed. The intercom system will include a feature to allow Authority management to forward the intercom to selected other land phones or cell phones to a sub-master in a cashier booth.

Once activated the intercom line remains open until the parking management staff terminates the call.

2.1.2 Barriers

All barriers for public entry lanes shall meet the following requirements:

1) Commercial Off-The-Shelf (COTS) software for barrier control
2) Barriers controls shall provide an interface to accommodate future EZ-Pass functionality
3) Barrier gate with padded gate arm including an electronically controlled rebound feature (minimum length of gate arm – 10 feet.)
4) Non-resettable back out counter mounted in the barrier gate housing
5) Non-resettable entry loop counter mounted in the barrier gate housing
6) Lane Control and Interface Processor (LCIP) to control equipment component

communications within the lane and to the CDMS

7) Barriers shall include a retraction mechanism and retraction logic, so as to avoid damaging vehicles

2.1.3 Patron Processing

2.1.3.1 Typical Entry Lane Processing

Each entry lane shall be equipped with an embedded loop C which will be positioned one (1) foot beyond the gate arm. Loop C shall be used by the LPR subsystem as an activation trigger to signal a camera to photographically grab a required number of the License Plate Number (LPN) frames. The LPR subsystem shall be programmed to detect a vehicle after it has cleared the entry lane barrier gate arm.

The LPR subsystem operation shall be transparent to the Authority's patrons. The sequence number of the parking ticket issued shall be recorded in an active inventory LPR database via a unique identifier. The LPR subsystem shall have programmed a Confidence Factor (CF) to determine the best single image to be stored within the LPR subsystem's active inventory LPR database. The extracted LPN, and the entry lane ticketed information shall be stored in the LPR database for subsequent "matching" of an exit lane transaction. The associated entry lane ticket information shall be stored within the LPR database as well as the PRCS database.

Should the license plate characters be unreadable, an appropriate alarm shall sound and the image shall be transferred to an operator at the Image Review Work Station (IRWS) for manual reading as described below.

There are four reasons for visually reviewing a license plate recorded at entry and making a manual correction. Each of these exception events shall be alarmed to an IRWS. These four reasons are:

1) **Image Quality Too Low:** The image quality may be too low for the system to accurately record a license plate number.
2) **Low CF:** The LPR subsystem shall permit manual intervention in determination of the LPN when a vehicle's electronically selected LPN has a low CF and, therefore, requires manual intervention.
3) **LPN Already In Inventory:** It is possible that a LPN for a preceding transaction was not removed from active inventory. Therefore, when the vehicle re-enters the parking facility, an alarm will be dispatched to the IRWS that a match has been found. It this event, the operator will verify the entry event's accuracy and log the entry as a valid entry. At the same time, the operator will determine a reason for the previous entry not being removed from the active inventory. The previous entry event shall be removed from active inventory and added to the inactive inventory.
4) **No LPN Found:** The license plate characters are unreadable due to obstruction by a trailer hitch, physical damage to the license plate (bent), or other reason. If manual read is possible, the LPR subsystem shall allow that the characters be manually entered into the system and correlated with the LPR database. Should the license be unreadable, a record shall be maintained of readable

characters and provided to assist manual purging of residual data in the LPR. In an event that there is no discernable LPN, the operator will input a generic number that shall be retained within the system for subsequent recall for an existing transaction.

Each of these exceptions shall be enunciated to the Parking Office via an audible alarm that shall continue until acknowledged by an operator. The operator shall have at least four (4) images presented for viewing. Image size shall be adjustable by the operator and provide a minimum image size of 3 inches by 3 inches per image.

2.1.4 Entry Lane Logic

Entry Lane Directional Logic – a lane logic device shall detect legal entry, illegal exit, stolen ticket and back-out.

A legal entry occurs when the entering vehicle is detected by the Entry Station's dual arming loop and the barrier gate's closing loop devices.

An illegal exit occurs when a vehicle is attempting to exit a facility by going through an entry lane as detected by the barrier gate's closing loop device being activated first. In such cases the gate shall not open. The entry lane components shall be unaffected by an illegal exit. This event shall generate a transaction on a Daily Event Log. The illegal activity shall also cause an audible alarm to sound on the Authority workstations. The audible alarm shall automatically cease after a predetermined length of time (adjustable by the Authority) or shall deactivate upon manual acknowledgement by an authorized system operator.

A stolen ticket occurs when a patron enters the lane, the vehicle is detected, a parking ticket is issued, the patron removes the parking ticket in the Entry Station's ticket slot, and the patron backs out of the entry lane. A stolen ticket that is detected would cause the barrier gate arm to lower to the closed position, record the entry transaction as a stolen ticket, invalidate the stolen ticket, and reset the arming loop devices for a subsequent transaction.

A back-out occurs when a patron enters the lane, the vehicle is detected, a parking ticket is issued, the patron leaves the parking ticket in the Entry Station's ticket slot, and the patron "backs out" of the entry lane. A back out that is detected would cause the barrier gate arm to lower to the closed position, record the entry transaction as a "back-out," invalidate the retracted parking ticket not taken, and reset the arming loop devices for a subsequent transaction.

For all entry stations that dispense tickets, the vendor will provide three loops with directional logic:

1) Reverse activity voids ticket in system for:
    a) A-B-A
    b) A-B-C-B-A
2) Reverse activity ticket coded system as:
    a) Back-out – ticket dispensed but not taken and is ingested after

programmable seconds in housing

b) Stolen – ticket dispensed and taken

Ticket dispenser features include:

1) Low ticket stock alarm
2) Empty ticket alarm
3) Gate up alarm
4) Back-out alarm
5) Stolen ticket alarm
6) Remote gate vend – records location, time, user id, and reason for gate vend. Recorded in event journal which can be sorted by any field for a single or multiple selected lanes/facilities

This logic shall be part of the lane controller and the events communicated to the designated parking office for alarm and display. Alarms shall indicate the specific area, lane, event, and date/time of the alarm. The event shall also be logged in a Daily Event Log and be able to be filtered by type (i.e. stolen, backout). Alarm events will remain in message queue until acknowledged and then logged.

The Daily Event Log shall be maintained in real-time in an electronic file or database viewed by authorized staff. The Authority shall have the ability to select if the Daily Event Log is also to be printed in real-time to a printer. It shall also be possible for the Authority to query and export the Daily Event Log. The historical events shall be available online with the ability to query, filter, sort, export, and report on transactions by date/time, lane, event, or cashier at a minimum for researching system problems and audit trails.

2.2 EXIT EQUIPMENT

2.2.1 Exit Station

Exit Stations shall be able to process tickets, credit cards, debit cards, access cards and ISO 14443 compliant contactless cards. The patrons shall be able to pay the parking fee at a card reader that is placed on the side wall of the cashier booth in a dual-equipped lane (cashiered or automated) at an automated exit lane.

All exception transactions e.g., lost tickets, insufficient funds, validations/non-revenues shall be processed through a cashiered exit lane.

2.2.1.1 Minimum capabilities required at an automated exit lane

1) Ticket reader/validator that accepts magnetic stripe and/or barcode encoded parking tickets and credit/debit cards through the same single slot. A printer shall have the capability to print a patron receipt and/or a credit/debit card voucher that requires no signature
2) Contactless card reader/validator that accepts ISO 14443 standard contactless cards.
3) Counts:
    - Non-resettable mounted counter on Exit Station that increment each

time a transaction is processed at the Exit Station.

- Non-resettable mounted counter on Barrier Gate that increment each time the gate is vended.
- Transactions counts located in system reports that identify the total number of transactions processed for a given time by the Exit Station and also provides counts for each transaction type (i.e. tickets, access cards)
- Vehicle counts based on loop activity for reporting to the Space Count System. LCIP to control equipment component communications within the lane and to the CDMS.

2.2.1.2 Minimum equipment required at a dual-equipped exit lane

1) Include all equipment and functionality listed in Section 2.2.1.1.
2) PC based Cashier terminal shall operate the exit cashiering functions with integrated credit/debit card reader/voucher printer, contactless card reader, receipt printer, cashier fee display capable of being easily read in direct sunlight and at night with fluorescent booth lighting, and either an active matrix display or LCD monitor. Display shall have brightness and contrast controls to allow an operator easy viewing and recognition of information under all lighting conditions.
3) External patron fee indicator that is capable of being easily read in all ambient lighting conditions with minimum character size of two (2) inches. The patron fee indicator shall be permanently mounted in such a position it is visible to the patron in the visual path of the exiting process and does not require a special effort by the patron to see the fee display, and that nothing can be placed between the patron and the patron fee indicator. The external patron fee indicator shall meet the following minimum specifications:

Table 2-2: Patron Fee Indicator Minimum Specifications

Minimum Pixel Patch	7mm
Luminance	3000 cd/m^2 - 7000 cd/m^2
Color Displayed	Monochrome – Red, Yellow, Green, Amber, and Blue Tri-Color – Total 16 color combination
MTBF	100,000 hours
Viewing Angle	Horizontal - 70°/Vertical - 35°
Working Environment	Outdoor rated. Temperature: -4°F to 140°F, Humidity: 15% — 95% RH
Communication Methods	RS232, RS422, Email, Modem, RF Modem, GSM Modem, or Ethernet
Communication Distance	Max. 15 meters for RS232, 1200 meters for RS422

Memory Retention	Over 1 year. Backup with CR cell battery, flash memory
Minimum Matrix Size	8 pixels high by 24 pixels wide

Patron Processing Procedure - the average demonstrated amount of time taken by the equipment components to process a routine transaction (read the ticket, calculate the length of stay, calculate the parking fee, calculate the change due if a cash transaction, print the transaction information on the parking ticket, and issue a receipt or credit card voucher), not an exception transaction (e.g., lost ticket, insufficient funds), shall not exceed the time allocated in Table 1-5. Failure to maintain these standards shall result in the imposition of liquidated damages by the Authority unless issue is caused by Authority network downtime. Repeated failure to correct shall constitute an event of default.

All transmissions from exit lanes in the garage locations will transmit credit/debit card numbers across the Authority LAN. It shall be the responsibility of the Contractor to transmit these numbers encrypted to appropriate servers and/or network routers for verification and storage.

2.2.2 Barriers

All barriers for public exit lanes shall meet the following requirements:

1) COTS software shall be used for barrier control.
2) Barriers controls shall provide an interface to accommodate future EZ Pass functionality.
3) Mounted non-resettable counters that activate each time the barrier gate is vended.
4) Barrier gate with padded gate arm including an electronically controlled rebound feature (minimum length of gate arm – 10 feet.)
5) LCIP to control equipment component communications within the lane and to the CDMS.

2.2.3 Vehicle Detection on Exit

Vehicle Detection - upon entering an open exit lane, the vehicle shall pass within the two loops, A and B, and stop at the cashier booth's window or ticket reader. The vehicle's presence within the trigger and arming loop shall dispatch a signal to "arm" the cashier terminal or ticket reader depending on the type of exit lane.

The vehicle leaving the barrier gate's closing loop C shall

1) Cause the closing loop counter to increment by a count of one
2) Reset the cashier terminal for the next transaction
3) Lower the barrier gate arm to the closed position
4) Reset lane transactional process allowing initiation of a new transaction

5) Causes logging of the past transaction (the transaction and payment details shall be provided to the CDMS for audit and subsequent inclusion in the reporting process)

A lane counter shall increment by a count of one when the lane's loop logic detects that a vehicle has completed the exiting process by crossing all loops in the exiting direction: A-B-C.

A vehicle's passage over the barrier gate's closing loop shall cause the parking Space Count System (SCS) to increment by a count of one the number of available parking spaces in the parking facility. In addition, all three loops should have the ability to cause the SCS to increment even in reverse activity. The patron fee indicator shall reset when the vehicle is no longer detected over the loops.

For purposes of transactions audit, three separate counts of a vehicle's exit from a parking facility shall be made by three counters:

1) **Lane Counter –** a count of one whenever a vehicle passes in the exiting direction over all three functioning loops.
2) **Closing Loop Counter –** a count of one when the vehicle is no longer detected on the barrier gate's closing loop C.
3) **Barrier Gate Action Counter –** a count of one when the barrier gate arm lowers to the closed position after the vehicle has exited.

These counts shall be maintained and reconciled within the parking SCS, section 2.4.

2.2.4 Patron Processing

2.2.4.1 Typical Exit Lane Processing

An automatic LPR subsystem shall be installed in all public parking exit lanes. When a vehicle is detected at an exit lane, the camera shall grab an appropriate number of images of the vehicle's LPN. If necessary, a separate "trigger" loop shall be installed to cause camera activation. The extracted frame grab shall be digitized for processing and automated character reading.

As with typical vehicle entry, there are four reasons for visually reviewing a license plate recorded at exit and making a manual correction. Each of these exception events shall be alarmed to an IRWS.

Once alongside the exit station, the driver will insert their ticket into the reader/validator slot. The PRCS shall send the unique ticket identifier to the LPR database and the PRCS shall conduct an unique identifier matching search. Assuming a successful match with an entry ticket ("Match Found" condition), the stored license plate number correlated to this specific parking ticket shall be compared to the license plate number extracted at exit. If there is a successful LPR match, a "Match Found" message shall be communicated to the PRCS database for parking fee calculation.

If the license match search was unsuccessful ("Match Not Found" condition), the transaction shall be processed as one of the exception transactions identified below:

1) **"No Match Found":** If the LPN search fails to locate a matching LPN, a "No Match Found" alarm message shall be sent to the IRWS. The IRWS operator

will acknowledge the alarm message, and attempt to locate a matching LPN. The IRWS operator will visually review the LPN pictures grabbed at exit and manually enter the LPN if appropriate. If the manually entered LPN is a match to a LPN in the active inventory, the correct LPN will be dispatched to the attendant making the request and the attendant will process the ticket and exit event as a "normal" transaction. If the manually entered LPN remains a "No Match Found", the attendant will process the transaction as an "exception" transaction based solely on the unique identifier. A search shall be conducted of the active inventory to determine the actual LPN that was recorded at entry to maintain the data integrity in the LPR database.

2) **"Switched Ticket":** If the LPN correlation identifies an LPN that fails to correspond to the LPN number attached to the unique identifier stored in the LPR database, a "Switched Ticket" alarm message shall be sent to the IRWS. The IRWS operator will acknowledge the alarm message and review the entry and exit LPN photograph images. If the system functioned appropriately and the LPN's match at entry and exit (i.e the patron is using an incorrect ticket), the LPN shall be added to an LPR gray list and the entry and exit data recorded with the LPN entry and exit photos which shall be obtained from the LPR database. The LPR data shall then be used to calculate the appropriate parking fee and process the exit. If the system functioned inappropriately, and the LPN's do not match at entry and exit (i.e the patron is using the correct ticket) the ticket data shall be used to calculate the parking fee and all transaction data shall be logged in the LPR database.

3) **"Multiple Match":** If the LPN search identifies one or more identical LPN's within the parking facility, a "Multiple Match" alarm message shall be sent to the IRWS. The IRWS operator will acknowledge the alarm message and select the best image, manually enter the LPN and LPN State, and close the screen. The IRWS operator shall be able to perform a manual correction and clearing of old/bad entry images.

Once a transaction is completed, a Transaction Complete Message (TCM) shall be transmitted from the PRCS to the LPR subsystem. The vehicle's LPN shall be deleted from the active LPR database and added to an inactive LPR database.

The cashier terminal shall completely process a transaction in not more than 9.5 seconds after activation of the dual arming loops in the respective exit lane, excluding any time delays due to the cashier's and patron's interaction.

2.2.4.2 Express Exit Lanes and Unattended Cashiered Lanes

A patron shall pay the parking fee due using a credit/debit card or contactless card at an express exit lane or at a cashier booth that is unstaffed.

1) Once the patron has stopped the vehicle alongside the exit station, a message informing the patron of the actions to be taken shall be shown on the patron display that is built into the exit station. The patron shall insert an encoded parking ticket into the card reader slot. The ticket reader shall process the ticket information and display the parking fee on the display.

2) The patron shall be instructed to insert a credit/debit card into the single-slot UCD or tag their contactless card at the reader. The transaction shall be processed causing a signal to be sent through the LCIP to the barrier gate to raise the barrier gate arm.

   In case of credit/debit card transactions, the patron's card shall be ejected to a position that the patron can extract it. After the card is extracted, a credit/debit card voucher shall be printed and ejected. In case of contactless card transactions, a receipt shall be printed and ejected after successful completion of the transaction.

2.2.4.3 Attended Cashier Lanes

A patron shall be able to process a credit card, contactless card, or cash transaction at an exit lane attended by a cashier.

A cashier terminal shall, in normal operation, be capable of processing only one transaction with the same vehicle in position within the dual arming loops. However, it shall be possible to process a second transaction for the same vehicle, using a software override feature provided to the cashier terminal from a supervisory workstation, for example, disabled vehicle being towed. The cashier shall initiate the dual transaction request that shall be acknowledged by a supervisor.

The Daily Event Log entry shall include requesting and authorizing personnel identities, date/time, and details of the request (such as payment of the previously authorized credit). Such action shall be recorded on the Daily Event Log as an exception transaction. All exception transactions shall be recorded on the Daily Event Log.

The following procedures shall be used for a cashier transaction:

1) The cashier terminal is activated by the vehicle being present in the arming loop. The patron inserts a parking ticket into the ticket reader/validator, or the cashier manually enters entry information for a lost ticket or other exception transaction. The cashier terminal's PC shall calculate the parking fee due, and show the parking fee on the patron display. The parking transaction shall be recorded to the cashier terminal's PC memory for subsequent printing as a part of the daily cashier shift report.
2) The patron shall make payment to the cashier. Payments of cash, credit, debit and contactless cards shall be accepted. The cash drawer shall not open for non-cash transactions.

2.2.5 Cash Payment at Cashier

The cashier manually enters the amount tendered via the cashier terminal's keyboard or touch-screen. Pressing the appropriate key shall validate the payment, validate the parking ticket, and cause the cash drawer to open. The cashier dispenses a receipt if requested by the patron. The closing of the cash drawer shall dispatch a signal through the LCIP to the barrier gate to raise the gate arm to the open position. The cash drawers shall always be in the closed position when not actively engaged in a parking transaction. The ticket shall be made invalid from further use.

If the amount tendered is greater than the parking fee due, the cashier terminal's PC shall calculate the change due. The change due shall be displayed on the cashier's monitor and the patron fee indicator.

Should the received payment be less than the fee required, a message shall be displayed to the cashier indicating shortage and the additional amount due. Insufficient Funds Transaction is discussed in more detail in Section 2.2.9.5.

2.2.6 Magnetic Stripe Credit/Debit Card Payment

The patron shall insert their credit/debit card into the integrated credit/debit card reader slot located on the outside sidewall of the cashier booth. The credit/debit card number shall be read and the card information communicated to the credit card processor. The credit card processor shall provide authorization for all credit/debit card transactions.

Assuming the credit/debit card is accepted, the card shall be returned to the patron while simultaneously printing a credit/debit card transaction receipt. The patron shall extract the card and remove the receipt. For unmanned lanes, a programmable signature level will be provided.

If a credit/debit card is unreadable, a message shall be returned to the cashier's display that the card is unreadable and the cashier shall have the ability to manually enter the card number via the keyboard. The manual entry of a credit/debit card number shall be recorded on the Daily Event Log along with the identification of the person and/or location where the event occurred.

2.2.7 Contactless Credit/Debit Card Payment

The patron tags the contactless credit card on the card reader located on the outside sidewall of the cashier booth. The contactless credit and debit card process shall be the same as the magnetic stripe process described in Section 2.2.6 once the card is read by the contactless credit/debit card reader.

2.2.8 Credit/Debit Card Exception Exit

In all cases wherein a credit or debit card is read, the following most common exceptions may occur that require exception processing.

1) Card is expired
2) Card at exit is "unreadable"
3) Card is rejected

2.2.8.1 Expired Credit/Debit Card

When the patron inserts a credit/debit card into the ticket/card reader slot or tags a contactless card and the system is unable to locate the patron's details in LPR or LPI database, a "Card Not Found" message followed by a second message, "Press Intercom for Assistance" shall be displayed.

The attendant shall have the ability to press a "Card Not Found" key. This action shall prompt a screen to appear that requires the attendant to manually enter the vehicle's License Plate Number (LPN). This shall activate a search of the LPR or LPI database active inventory. A successful match shall cause the entry information correlated with the LPN to be located and the parking fee shall be calculated using this data.

Once the fee has been paid, the barrier gate arm shall raise to the open position and a TCM message shall be dispatched to the LPR subsystem to delete the correlated LPN from active inventory and add the LPN to an inactive inventory.

2.2.8.2 Unreadable Credit/Debit Card

An unreadable credit card at exit shall be ejected to the patron with an appropriate message, "Unreadable Card." Unreadable credit cards can only be processed in a cashiered exit lane. In a cashiered exit lane, the patron informs the attendant that the credit card is "unreadable." The attendant shall manually enter the credit card number. The PRCS system shall search the database for a match with an entry event.

Assuming a successful match, the LPN correlated with the entry event shall then be matched to the LPN extracted at exit for this specific transaction. The transaction shall then be processed for credit card authorization. Upon receiving positive authorization, the transaction shall be completed.

The barrier gate arm shall rise to the open position and a TCM shall be dispatched to the LPR subsystem to delete the correlated LPN from an active to inactive inventory.

2.2.8.3 Card Rejected

In an event that the card is rejected, the patron shall be asked to provide a second card or press the intercom button for assistance. If the patron's second card is accepted, the transaction is processed as a normal credit/debit card transaction.

If the second card is rejected, a cash transaction or insufficient funds transaction must be processed or press the intercom button for assistance.

2.2.9 Exception Transactions

The PRCS shall maintain a database of all data entered into the cashier station for exception transaction processing. Such data can be obtained from system reports.

The Authority can select which exception transactions will require supervisor approval in order for the transaction to be completed by the cashier. Supervisor approval shall be available by manual input into the cashier station or by remote approval. The Authority shall be able to select which fields are required for each exception transaction type. All required fields shall be filled in before moving to next screen.

Following successful completion of each exception transaction, the vehicle LPN, whether manually entered or read by the LPR subsystem, shall be automatically deleted from the active inventory LPR database.

All exception transactions shall be capable of being accommodated in series with other exception transactions (i.e. towed vehicle with lost ticket, lost ticket with insufficient funds, etc.) An explanation of how such dual transactions affect transaction counts (both the mounted counters and system counts) shall be provided. Any single exception transaction identified below shall be able to be disabled without impact to the normal functioning of any other exception transaction.

2.2.9.1 Lost Ticket Transaction

All lost ticket transactions will be processed through a cashiered exit lane. The required lost ticket data shall be entered by the cashier into the cashier station. This data shall be made available for reporting and analysis purposes.

The patron notifies the cashier directly that they have lost their ticket. The attendant will press a "Lost Ticket Button." A "Lost Ticket Form" shall be displayed on the screen and information keyed in to complete the transaction.

For both "Match Found" and "Match Not Found" conditions (defined below), the LPR subsystem shall display a window showing all gray list transactions for the patrons LPN. This information shall be available to the cashier during any discussions with the patron. The current Lost Ticket transaction shall be automatically placed in the gray list.

1) **"No Match Found":** If the LPN search fails to locate a matching LPN, a "No Match Found" alarm message shall be sent to the IRWS. The IRWS operator will acknowledge the alarm message and request the attendant to process the exit by requesting the entry time and date from the parking patron. This information shall then be entered into the system by the attendant. In addition, the following data of the transaction shall be included in a "No Entry" log: entry & exit time/date/lane, and vehicle LPN.

2) **"Multiple Match":** If the LPN search identifies one or more identical LPN's within the parking facility, a "Multiple Match" alarm message shall be sent to the IRWS. The IRWS operator will acknowledge the alarm message and review the entry and exit LPN photograph images. The IRWS operator shall be able to perform a manual correction and clearing of old/bad entry images. The action is required to be logged for auditing purposes. The ticket will then be re-inserted and the LPN match search shall be repeated.

The ticket reader/validator shall print the exit date and time on a blank ticket, the exit lane number, the parking fee due, and a transaction number.

Upon receiving payment, the exit lane processing shall continue as discussed in the above cash and card transaction processing sections.

2.2.9.2 Towed Vehicle

All towed vehicle transactions will be handled through a cashiered exit lane. The cashier pushes a key marked "Towed Vehicle". The photos taken from the LPR database shall be ignored.

When the "Towed Vehicle" function key is pushed, a Towed Vehicle form shall be displayed on the cashier's screen.

The license plate number of the towed vehicle shall be manually entered by the Cashier. This information shall be used to search the LPR database for entry time of the LPN. All available tickets will be collected by the Cashier and attached to the "Towed Vehicle" form and turned in at shift closeout.

A Towed Vehicle Form shall be printed from the receipt printer including all transaction data identified above. This form shall include space for the signature of the tow truck driver. Following completion of the Towed Vehicle transaction, the tow truck entry and exit data (including images) shall be cleared from the LPR database.

2.2.9.3 Unreadable Tickets

Unreadable tickets shall be processed through a cashiered exit lane. For the purposes of this Section, an Unreadable Ticket shall be defined as a ticket on which the magnetic stripe is empty of data or contains information which is incomplete or the barcode information is mutilated.

When a ticket is found to be unreadable by the PRCS, the cashier shall press an "Unreadable Ticket" transaction key that shall trigger the LPR subsystem to search for entry data for the vehicles LPN. If a positive match is found, the parking ticket's unique identifier issued at entry shall be extracted, compared to the cashier terminal's exit time, and the parking fee shall be calculated. If no matching LPN is found, the cashier shall be allowed to manually enter the entry time as printed on the issued ticket. The cashier should have the ability to use an LPI search pause function. The parking fee shall then be calculated based on this manual entry. The unreadable ticket shall be retained and turned in upon end of shift using a ticket vault.

2.2.9.4 Oversized Vehicles

All oversized vehicle transactions shall be handled through staffed exit lanes.

The oversized/overlength vehicle passes over the LPR camera trigger loop but does not actually "trigger" this loop due to its length and continued presence over the loop. The driver will insert their ticket into the PRCS exit reader. The system shall recognize that no exit LPN picture has been taken. The LPR subsystem shall verify the presence of a vehicle over the camera trigger loop.

If presence is detected, the LPR subsystem shall immediately send an "Overlength Vehicle" message to the PRCS and sound a unique alarm at the IRWS. The operator at the IRWS will visually verify the presence of an overlength vehicle and acknowledge the alarm. IRWS operator approval and receipt of the "Overlength Vehicle" message shall immediately switch the PRCS to a temporary (one-transaction) LPR off-line mode. The exit shall be processed using the entry and exit ticket data only. Upon successful completion of the transaction, the LPR subsystem shall be switched back on-line. The

ticket's unique identifier shall be used to search for and delete the associated LPN picture data from the LPR database following successful processing of the vehicle at exit.

If no vehicle presence is detected, the PRCS shall "wait" for response from the LPR subsystem until expiration of a defined time out. This process shall be the same as for all other LPR transactions.

2.2.9.5 Insufficient Funds Transaction (ISF)

All ISF transactions must be processed through a cashiered exit lane.

The cashier shall press an ISF transaction key to process an ISF transaction. Upon pressing the ISF function key, a screen shall appear in the cashier's display unit as an electronic "Insufficient Funds Form."

The cashier shall obtain the patron's name, address, phone number, driver's license number, state of issue and vehicle information, as required by the ISF form. Three copies of the ISF form shall be generated - one copy to be signed by the patron and returned to the cashier. Two copies shall be provided to the patron. The patron shall return one copy of the form to the Authority along with the appropriate payment. The ISF form shall be included as part of the cashier's daily turn-in at end of shift.

The PRCS shall maintain a database of all paid and unpaid ISF transactions with the ability to generate reports containing ISF paid and unpaid transaction information along with the data input into the cashier station. When a patron attempts to exit while having one or more outstanding IFS transactions, an alarm shall be sent to the supervisor.

2.2.9.6 Check Transactions

All check transactions must be processed through a cashiered exit lane.

The cashier shall press a check transaction key to process a check transaction. Upon pressing the check function key, a screen shall appear in the cashier's display unit as an electronic "Check Transaction Form."

The cashier will enter the patron's driver's license number, state of issue, license plate number and phone number on the form. The PRCS shall verify that the patron does not have a history of bounced checks. If no such bounced check history exits, the PRCS completes the transaction and the patron is provided a receipt.

2.2.9.7 Special Parking Privileges

The Authority provides special parking privileges to designated patrons. The privileges include reduced parking rates or free parking depending on the accommodations agreed upon by the Authority. The Contractor shall provide an ISO 14443 contactless card encoder and reader so these special parking privileges can be redeemed.

All special transactions shall be processed at a cashiered lane. After the parking ticket has been inserted into the reader and a parking fee has been calculated, the cashier shall press a function key associated with the type of card presented by the patron. The reduced parking rate shall be applied to the calculated parking fee, or the fee

shall be reduced to zero as appropriate. The PRCS shall maintain a log of these special transactions by type. The PRCS shall maintain a record of activity for each card. The Authority shall have the ability to deactivate a card at any time.

2.2.9.8 Non-Revenue Access Cards

The Authority shall have the ability to issue and register non-revenue ISO 14443 compliant contactless access cards. At a minimum, the Authority shall be able to issue 9,999 different categories of non-revenue access cards. The access card encoding machine shall be provided to the Authority by the Contractor. The Contractor shall provide the Authority two (2) access card encoder stations to create and issue access cards.

The Authority shall have the ability to track access cards by type and date of issue at a minimum. The reporting package delivered with the PRCS shall allow access cards to be managed through the entire card lifecycle from inventory, issuance and expiration. The Authority shall have the ability to deactivate Non-Revenue Access Cards at any time.

With a vehicle in proper position as verified by the loops, the reader is activated and the patron instructed to insert a parking ticket or waive an access card. In the event an access card cannot be read or is invalid, the patron shall be instructed to use the intercom for assistance. The PRCS shall provide anti-pass back provisions for the access cards.

2.2.10 Receipt Printing

The PRCS shall allow modifications, additions, or deletions to the information printed on the patron's receipt and associated computer printout. At a minimum, the following information shall be printed and all time references shall be made in local military time.

2.2.10.1 Patron Receipt

1) "Ronald Reagan Washington National Airport" and below the airport's name, the airport customer service number, the airport address, and the parking facility's designation
2) Ticket exit sequence number, minimum eight-digit number (00000000 to 99999999)
3) Total parking fee up to $9,999.99
4) Discounts up to $9,999.99
5) Fee paid up to $9,999.99
6) Code for the transaction type (cash, credit/debit card, contactless card, insufficient funds, or non-revenue)
7) Credit card type (e.g., Master Card, Visa, etc.) and last four digits of the card number
8) Entry lane number
9) Entry number
10) Entry date and time
11) Exit lane number
12) Exit date and time

13) Code for the rate structure applied

2.2.10.2 Journal Printing

On Journal Printer or Electronic Journal from cashier terminal:

1) Ticket exit sequence number, minimum eight-digit number Exit lane identification code
2) Entry number
3) Entry date and time
4) Exit date and time
5) Code for the rate structure applied
6) Code for the transaction type (cash, credit/debit card, Contactless card, insufficient funds, or non-revenue)
7) Total parking fee up to $9,999.99
8) Discounts up to $9,999.99
9) Fee paid up to $9,999.99
10) Amount tendered if a cash transaction
11) Change due if a cash transaction
12) Card type (e.g., MasterCard, VISA, Access cards, etc…)
13) Last four digits of card number
14) Validation codes – minimum one thousand (1000) different classifications (minimum)
15) Non-revenue codes – twenty (20) different classifications (minimum)
16) For cancelled transactions, all data entered to the point of cancellation (routine transactions for which no cash was tendered, and the patron returned/backed-out to the parking facility)
17) Alarms and resolution
18) Cashier shift identification

2.2.10.3 Memory Registers

A cashier terminal's PC shall maintain, in separate memory registers, closeout totals and grand totals. The grand total register shall be non-resettable with respect to the transaction number and the dollar amount by anyone. It shall be possible for only a supervisor to call up the closeout total register at any given time during a shift to obtain closeout subtotals and at closeout when the cash trays are removed to obtain closeout totals. Calling up closeout totals (non mid-shift subtotals) will not reset the closeout memory register to zero.

When prompted by means of a supervisor-controlled password, a cashier's PC terminal shall print on the receipt printer the following information from the shift reports on the PRCS database (compiled by the individual closeout or day) as appropriate:

1) Printout type
2) Cashier ID
3) Cashier shift ID
4) Date/time of shift start
5) Date/time of shift termination

6) Lane number
7) Report month, date and time
8) Closeout start month, date, and time (closeout reports only)
9) Closeout end month, date, and time (closeout reports only)
10) Closeout start transaction number (closeout reports only)
11) Closeout end transaction number (closeout reports only)
12) Beginning cash in drawer
13) Total number of transactions and related dollar amounts by type (i.e. regular, lost ticket, unreadable ticket, ISF, Tow, Validations, etc.)
14) Grand total number of dollars at period start
15) Grand total number of dollars at period end
16) Total sales
17) Total number of transactions processed for each rate structure
18) Total sales processed for each rate structure
19) Number of non-revenue transactions by category
20) Total number of non-revenue transactions
21) Total dollar amount of non-revenue transactions
22) Total sales under each rate structure (grand total reports only)
23) Number of transactions under each rate structure (grand total reports only)
24) Number of credit/debit card and courtesy card transactions separated by card type (e.g., MasterCard, VISA, American Express, Diners Club, courtesy cards, and Smart Cards)
25) Total sales value of credit/debit card, and courtesy card transactions separated by card type (e.g., MasterCard, VISA, American Express, Diners Club, courtesy cards, and Smart Cards).
26) The request to generate the close-out report shall be logged on the Daily Event Log. The ID of the individual making the request shall be included on the Daily Event Log and printed on the report itself.

2.3. CENTRAL DATA MANAGEMENT SYSTEM

2.3.1 PRCS Interface with Financial ERP System

The Contractor shall configure the open architecture to allow for the PRCS to interface with MWAA's impending service-oriented financial ERP architecture.

The Contractor shall ensure that there will be no impact on the data integrity of the PRCS database.

The Contractor shall provide an interface that enables the export of PRCS data to the third-party ERP application for reporting and analysis.

2.3.2 General Requirements

Proof of performance shall be required for determination of the contractor's ability to comply with these PRCS requirements. Contractor shall submit a Factory Acceptance Testing (FAT)/Proof of Concept procedure for the Authority's approval and have the Authority's personnel present during testing prior to installation. The FAT shall include hardware and software configurations specific to the Authority's requirements.

The Authority's PRCS is to be developed for the unique characteristics of the Ronald Reagan Washington National Airport. The system shall to the greatest extent possible use COTS systems (software and hardware components) marketed and installed by revenue control contractors and manufacturers and shall embrace systems technologies that have been successfully implemented. The Contractor shall utilize premium grade equipment designed to operate reliably within the specified environmental and operating circumstances. All equipment shall be installed and tested by Contractor's technicians complying with manufacturers' recommendations. To the greatest extent possible and available, open architecture shall be utilized for operational and maintenance support subsystems.

The PRCS installed by the Contractor shall provide the Authority the capability to expand and upgrade their system to meet future Authority parking requirements for the next seven (7) years without having to replace major components of the PRCS system. For example, the PRCS shall be capable of adding new parking facilities, adding/removing lanes of equipment at existing facilities, and re-designating facilities.

The Authority requires the ability to adapt the software or add elements to the PRCS to meet the Authority's changing parking operations. The required features, functions, and essential requirements include, but are not limited to:

1) Multi-tasking system
2) Interoperability
3) Industry standard SQL databases
4) Commercially available solutions
5) Integration through open communications protocols
6) Non-Proprietary System
7) TCP/IP compliant
8) Reliability of hardware/software
9) System supportability

2.3.3 System Requirements

The PRCS' redundant, fault-tolerant Central Servers shall operate using the Windows Operating System – Clustering Solution operating platform or an Authority approved equivalent solution. The database shall be robust, proven, and commercially available and support Microsoft clustering – Oracle and Microsoft SQL Server are examples of such database management systems (DBMS.) All appropriate database system documentation shall be provided for the Authority's use.

Custom software required by the Contractor to operate the PRCS shall be supplied to the Authority with complete documentation and supporting flowcharts and block diagrams. Source codes, including any changes, updates or patches up to seven (7) years, for the contractor's custom software shall be escrowed and verified by a third party (code, compiler, tools, libraries and instructions) as specified elsewhere within the Technical Specification. The Contractor shall demonstrate to the Authority the

degree of internal documentation within software code before placing in escrow. Any software tools, supporting files and/or documentation for making and changing the system shall be provided in full. All escrowed software tool, supporting files and/or documentation shall be kept up to date with the latest upgrades and updates.

All data from the various sub-systems shall be maintained in the main database on the Central Servers by unique data fields.

This allows the individual transaction data to be accessed by the following items (at a minimum):

1) Ticket number
2) Transaction number
3) Date and time
4) Equipment identification
5) Lot designation/garage name
6) License plate number

All PRCS transactions shall be recorded in such a manner as to allow an audit to be conducted at all transaction, customer, and facility levels. The intent is to allow all transactions to be linked back to the master records for reporting, analysis, data retrieval, and legal purposes. The Authority requires an ability to create its own links during ad-hoc queries and reporting to collect and show all transactions in the system by category. For example, the Authority may desire to produce detailed transactions and summaries for one lot, at one piece of equipment, within a range of certain days and/or for a certain number of hours.

The PRCS shall be an open system where all interfaces (hardware and software) conform to recognized national and international standards published from organizations such as ISO. The PRCS shall use open system standards (e.g., IEEE 802.3 – defines the Ethernet communication protocol), and Open System Interconnection (OSI) as defined by ISO 7498, "Open Systems Interconnection".

2.3.4 PRCS Network Management

The PRCS shall be designed to support stand-alone operations (distributed system with intelligent field devices) as well as centralized management of the PRCS. Point-to-point communication between the field devices and fiber optic patch panels shall be utilized using the existing communications network. Fiber optic connectivity shall be provided in each field equipment component. The Authority will provide fiber optic communications between the field devices and the Authority's fiber optic backbone.

2.3.5 Data Storage Capacity

The PRCS Central Servers' on-line databases shall be fault tolerant for all operational functions - no data loss upon failure of any single component or associated interface. The database and memory shall be configured at a minimum:

1) Maintain five (5) years of on-line data of all transactions - entry date/time, exit date/time; parking facility entry and exit lane identification; parking length of stay calculation; parking fee due; parking fee paid; payment method; credit card details including credit card type, and authorization code; and other information considered as part of the transaction.
2) Archive all summary reports for up to five (5) years on electronic media with simple retrieval capability. The Contractor shall provide a backup/archiving system whereby reports are properly catalogued, such that historical data can be retrieved, added to new reports, or printed.
3) Keep operational data on-line for the prior five (5) years. Operational data includes: lane closure date/time with cause for closure and equipment failures; the failed equipment component shall be identified by functional name, model number and serial number; daily event log of exception transactions including date, time, parking area, lane, complaint or problem identification, and resolution.
4) Detailed event data shall be maintained for five (5) years. The complaint or exception information shall be easily retrievable and software provided to assist an operator in building and maintaining a report/database of complaint and/or problem incidents.
5) The Contractor shall size the fault tolerant PRCS Central Servers' hard-disk capacity to have five (5) years active data on hard disk along with software and other programs required to operate the system. Provide from the workstation "Real-time Revenue and Ticket Query" - immediate access by a Supervisor of any cashier, card exit reader, and entry lane or exit lane to monitor their current balance, number of transactions, and ticket count.

2.3.6 System Performance

The PRCS shall operate twenty-four (24) hours per day, seven (7) days per week. A *failure* shall be defined as any malfunction that causes the loss of functionality according to specifications. A *system failure* is when the loss of more than one function occurs. System failures shall not occur more than 0.02% of the time.

The system shall have minimum accuracy as defined below in Table 1-4 for each individual lane and cumulative for all lanes:

Table 2-3: System Performance Levels

Fee calculation accuracy	99%
Transaction counts	99%
Exception counts	99%
Sequence counts	99%
Revenue	99%
Calculations	99%
Parking SCS	See Section 2.4

Table 2-4: Transactional Time Requirements for all Non-Human Related Factors (NHRF)

Entry Events	Budgeted Time (Sec)
After patron presses ticket issue button or presents contactless card a ticket is dispensed or card is read	3.0
Ticket is pulled or card is verified and gate opens	2.0
Vehicle clears gate	Human Factor
Gate closes	1.0
Total NHRF Time	**6 seconds**
Cashier Events – Regular Transaction	**Budgeted Time (Sec)**
After patron inserts magnetic stripe parking ticket, the ticket is ingested and read	0.5
LPR verification and parking fee is computed and displayed on the cashier station and the patron fee display	3.0
After patron inserts credit card it is ingested and read	0.5
Credit card payment is authorized or cashier processes a cash payment with amount tendered and change due	5.0
Payment is validated on ticket	2.0
Receipt is issued	2.0
Gate opens	1.0
After vehicle clears gate, gate closes	1.0
Total NHRF Time	**15 seconds**
Automated Exit Events - Regular Transaction	**Budgeted Time (Sec)**
After patron inserts magnetic stripe parking ticket, the ticket is ingested and read	0.5
LPR verification and parking fee is computed and displayed on the exit	3.0
After patron inserts credit card it is ingested and read	0.5
Credit card payment is authorized	3.0
Payment is validated on ticket and receipt is issued	2.0
Gate opens	1.0
After vehicle clears gate, gate closes	1.0
Total NHRF Time	**11 seconds**

2.3.7 Maintainability Requirements

The Authority shall be provided the ability to maintain the system by eliminating faults and keeping the hardware or software in satisfactory working condition. This ability includes conducting applicable tests, measurements, replacements, adjustments, and repairs as is detailed in the Contractor-submitted PRCS Administration Maintenance Manual (CDRL 201) presented to the Authority upon final acceptance of the system.

All systems and equipment shall:

1) Incorporate features that minimize the maintenance practices for preventive maintenance, failure repairs, and performance verification, including the use of SNMP at all functional levels of the system. Where fault tolerance is provided, "hot swappable" components shall be supported.
2) Equipment shall be designed for easy access, minimizing removal of items to gain access to a specific part. Access time shall not exceed 10% of allocated Mean Time To Repair (MTTR.)
3) The requirement for special tools and test equipment shall be minimized. Any special tool or equipment used shall be provided to the Authority by the Contractor.
4) The Authority shall have the capability to verify performance, detect failures, and make adjustments with a minimum effort.

The PRCS proposed for the Authority shall have been, prior to award of contract, successfully operational at no less than two airport facilities for at least one (1) year. The Contractor shall build into the system structured exception handling so that the system responds predictably to error conditions without lock-up or "crashing," and without distribution of corrupted data throughout the system. Error handling shall include those caused by hardware failures, those caused by operators, and those induced deliberately or non-deliberately in software.

2.3.8 System Hardware

The Contractor shall utilize a redundant, fault-tolerant server system that provides parallel data read/write capability and cross checking between the primary and secondary servers. A transparent, automated software switch shall be provided to detect that a primary server has failed, the secondary server has "taken over," and dispatches an alarm to the Applications Administrator that a PRCS Server has failed.

2.3.8.1 Facility Servers/Workstations

Workstations shall run Microsoft Windows operating system on the PRCS Central Servers. All facility servers/workstations shall have identical GUI and functionality. Workstations shall utilize identical GUI that supports:

1) Graphical presentation of operational events at lanes and statistics
2) Graphical presentation of system overview operational status

It is the Contractor's responsibility to verify that the specifications below are adequate for the proposed PRCS. Any deficiencies, changes, or suggestions shall be identified in the

Contractor's proposal.

2.3.9 Software Requirements

For all software implemented for the PRCS that collects, organizes, and stores data, the Contractor shall provide the Authority with a Data Dictionary that textually and graphically details all data fields including their lengths, formats, and descriptions. A Data Table Map (CDRL 207) on a CAD-sized drawing (D-size paper) showing the parent-child relationships between the tables and data elements shall be submitted to the Authority in hard and soft copies.

2.3.9.1 COTS Software Requirements

To the greatest extent possible, industry standard software packages shall be utilized. Each such software package shall be identified in Commercial Software Package list, (CDRL 202). The Contractor shall state the purpose of the software package, where it will be used, and how it will be used. If one software package is required to interface with another software package, the interface shall be documented and supported by flowcharts or block diagrams as appropriate. The use of "middleware" shall be kept to a minimum.

2.3.9.2 Software License Requirement

The Contractor shall provide appropriate software licenses as required for each of the software programs that have been developed or supplied off-the-shelf to operate the PRCS. If available, a site license shall be provided to the Authority. The Authority shall have the option to convert the site license(s) to an Enterprise license. Licenses shall include future updates during the warranty period as required by this specification. The Contractor shall submit in the proposal a listing of all software licenses the proposed PRCS will require.

2.3.9.3 Variable Rate Functional Module

The system shall be capable of charging variable rates based upon the time of day, day of week, and time of year. The system shall contain a software module whose purpose is to verify that the "system date" input by the operator is "reasonable" when compared to the last known system date. Verification such as this shall help detect operator-input errors that could dramatically impact the parking fee calculation.

2.3.10 Central Data Management System (CDMS) Security

The PRCS Central Servers shall have secured access. An appropriate password system shall be supplied by the Contractor that is based upon a "need-to-know" decision. The Authority shall have complete control to add to, delete from, or revise the passwords that are established by the Applications Administrator.

Since the PRCS will be part of the Authority's LAN, the Contractor shall provide the necessary provisions so that it will not be possible to gain remote access to the CDMS through the Authority's network. Firewalls, gateways, and the like shall be described in

detail during the design review for the Authority to evaluate the adequacy of the planned security features.

If software transmissions are required they shall be downloaded via an Authority FTP server. The Contractor shall notify appropriate Authority personnel within 4 hours, by completing form Notice of Personnel Change (CDRL 206), of any authorized support personnel that changed functional support responsibilities or terminated employment while still possessing valid user names and passwords to access the Authority LAN/WAN infrastructure.

2.3.10.1. PRCS Access

The PRCS CDMS and network shall be integrated with the Authority's existing network. A user's rights shall permit or restrict access to PRCS applications and files. The Authority will be given administrator rights to create new users and manage privileges of all users.

The Contractor shall provide a secure remote interface to the PRCS CDMS. The secure interface shall support only those designated personnel who are authorized to remotely interact with the PRCS Central Servers. The security functions provided by the remote interface shall include but not be limited to:

1) Firewall application access – no unauthorized, remote address shall be given access.
2) If the remote address is authorized, access shall be provided after a personal identification number (PIN) check. If access is authorized, an audit trail shall be maintained and provided as a report including:
    a) transaction date/time
    b) remote access address requesting access
    c) PIN file requesting access
    d) identity of file(s) and/or application(s) accessed and the number of records
3) Where the authorized remote address is requesting modification to the PRCS Central Servers' database, an authorization check shall be made based on the requester's PIN. Where the change and/or update is authorized, an audit trail containing, but not limited to the following information shall be provided:
    a) date/time of change
    b) remote access address making change
    c) authorization PIN code to make change (varies based on type of clearance)
    d) record of change made
    e) record of data modified or changed (prior to change)
    f) file identities and record count
4) The contractor shall install and test the security functions in co-ordination with the Authority

2.3.11 Communications Infrastructure

The Authority will provide all fiber optic cabling, hubs, switches, and routers for the PRCS. For every parking facility, the Authority will have fiber optic cabling routed from the facility server/workstation to each lane.

The Contractor shall provide exact cabling specifications to the Authority. It shall be the Contractor's responsibility to provide and make the connection of the fiber optic cabling to their equipment.

From the facility server/workstation, the PRCS will be on the Authority's LAN. The Contractor will be responsible for setting, connecting, and configuring the facility servers/workstations in co-ordination with the Authority.

2.3.12 Reporting Requirements

The vendor shall provide the Authority with complete read/write/update access privileges to the PRCS database environment and provide the Authority with privileges to design, create and generate reports (including any ad-hoc reports) based on any PRCS criteria deemed necessary by the Authority. The Authority will be allowed to password protect all access to the PRCS. All reports shall be tested for data accuracy.

Each report shall be available on-screen and hard copy in identical format. Reports shall be formatted for printing on standard 8.5" x 11" paper. The LPR subsystem shall be capable of importing and exporting data to/from any forms in tab-delimited ASCII data format. All printed reports shall include the date and time the report was generated. Fully functional "print screen" capability shall be provided for all reports. All columns in standard reports that are not used by the Authority be removed and that Column headings be changed for the Authority's nomenclature.

Standard reports can be filtered and sorted based on field data contained within the report including but not limited to:

1) Parking Facility – all, a mix, or a single facility
2) User type – transient, credential, VIP
3) Lane(s)
4) Device Type
5) Device ID
6) User ID
7) Transaction Type
8) Payment Method
9) Date

Standard reports can be generated for selectable time periods:

1) To mm/dd/yy hh/mm
2) From mm/dd/yy hh/mm

All reports will provide transaction and revenue totals for the data included in each report. If users change field titles in screen options, the new titles will flow into the reports. Some of the reports will provide graphical presentations of the data.

Report Output Options:

1) Screen/Monitor
2) Printer
3) Converted to a file for export

Other Report Features:

1) The software will provide a query management tool for simple data searches.
2) Custom reports can be generated with the Crystal Reports.
3) Report data can be exported into Excel or Access.
4) The software will provide a description field explaining report contents.

The software will provide a search function for report contents.

All reports created by the vendor shall be made available to the Authority at no additional cost. The following are minimum required reports. Reports shall be able to be either viewed on a workstation monitor or printed.

1) **Individual Shift Report –** A summary report of one cashier's daily activity by shift. Because this report is used extensively, a layout that allows quick auditing is essential. The report format should be on one page. Detailed transactions should not be included in the shift report. Exception transaction detail may be attached to the report. Report will provide:

    a) Summary of cash transactions (revenue and number of transactions).
    b) Summary of credit card transactions (revenue and number of transactions) by credit card type, with a grand total of credit card transactions.
    c) Summary of cash equivalents i.e. ISF and total validation transactions (revenue and number of transactions)
    d) Summary of non-revenue transactions (revenue and number of transactions) by type with grand totals.
    e) Summary of exception transactions (revenue and number of transactions) by type with grand totals.
    f) Summary of revenue transactions (revenue and number of transactions) by rate, with grand totals.
    g) Exit lane count totals:
        a. Gate vend counts for exit stations, credential reader transactions, and cashier terminals.

b. Loop counts for exit stations, credential reader transactions, and cashier terminals.
c. Transaction counts for all devices.

h) Number of voids.
i) Number of no sale activations.
j) Number of manual gate vends.

2) **Detailed Transaction Report** - Provide a chronological listing of each transaction processed by cashier, shift and lane. Shows method of payment, exception transaction type, discounts processed and cancelled transaction detail.
3) **Credit Card Reports**
   a) **Shift and Time Based Credit Card Reports –** System will provide reports that allow the user to balance credit card transactions to the PRCS shift reports and also to the bank settlement statements. Typically the bank daily cut-off time is different from the PARCS daily cut-off, requiring manual adjustment of the PARCS transactions to match the same time period as the bank. Also, some PRCS utilize virtual midnight, causing extra work to reconcile shifts that span over virtual midnight. The PRCS will provide the following reports to be generated for shifts and also to be generated for selected time periods (mm/dd/hh/mm/ss). Totals for count and revenue by card types will be provided at the bottom of the reports:

      - **Credit card summary report** for the selection facilities and date/time that provides the total number of transactions and dollar amount along with subtotal number of transactions and dollar amounts by card type.

      - **Credit card batch report** for the selected facilities and day/time that provides the number of transactions and dollar amount of each batch for each card type.

      - **Credit card detail transaction report** for the selected facilities, shift(s), and day/time that provides the detail of each credit card transaction with report totals of each column.

      - **Credit card manual entry report**. This report lists all credit card charges and credits manually entered into the system for a selectable facility(ies), lane, and/or date/time.
      - **Credit Card Virtual Midnight Report –** For PRCS using Virtual Midnight, this report provides, for a user-selected virtual date (from Virtual Midnight to Virtual Midnight), a list of the PRCS credit card transactions that have a transaction virtual date different from their posting date. This report will help users

balance the credit card reports with the other PRCS financial reports when a shift spans over virtual midnight.

- **Offline Transaction Uploaded** – Provides each transaction occurring in offline mode and status of upload once the system is back online.

4) **Daily Revenue Report** – Provides a summary of all shift activity for one day. It includes the number and revenue amounts for regular transactions, exception transactions, discounts, taxes, and net revenue.
5) **Daily Revenue Category Report** – Provides a lane-by-lane, booth-by-booth, or whatever group is selected report of revenue by defined category (cash, credit, validations, billings, etc.).
6) **Revenue Comparison Report** – Provides comparison of prior period and current volume and revenue activity for entire parking system or selectable facilities.
7) **Exception Transaction Report** - Provides all exception transactions in chronological order or by transaction type. Report will be available for a selected time period and also by cashier. Report can be generated for one exception transaction type or multiple selected transaction types. An exception transaction is defined as any transaction requiring a form of cashier intervention (i.e not an automated ticket). Exception transactions include but are not limited to:
    a) Lost ticket
    b) Unreadable ticket
    c) Stolen ticket
    d) Backout ticket
    e) ISF transactions
    f) Handicap parking
    g) Validations (must be sortable by type)
    h) Voids/Cancelled transactions
    i) Towed & Impound vehicles
    j) Non-revenue badges
    k) Disputed
8) **ISF Report** – Provides a list of outstanding ISF transactions sortable by date, parker, cashier, or dollar amount. This report includes the dollar amount of gross parking fees, ISF dollar amounts relating to those fees, and grand totals.
9) **ISF Aging Report** – Provides a list of outstanding ISF transactions with a primary sort being the date and a secondary sort selectable by name, address, driver's license number, or any other report field.
10) **ISF Paid Report** – Shows a list of ISF transactions that have been paid within a selectable time period.

11) **Lost Ticket Report –** Provides a list of lost ticket transactions for a selectable time period, parker name, address, or any other fields in the report (exit date, transaction number, parking fee, entry time, parker last name, first name, phone, vehicle license plate, driver's license number, or any field designed in the cashier terminal customer information data screen).
12) **Cancelled Transaction Report –** Provides original date, time, transaction type, and fee for both the cancelled transaction followed by the completed transaction. Report will be available for a selected time period and also by cashier. This report is used to audit cashier activity and performance.
13) **Non-Revenue Report** - Provides all non-revenue transactions in chronological order, by type, and/or cashier for a specified time period up to monthly.
14) **Cashier Performance Report –** Provides trend analysis of cashier activity for:
    a) Exception transactions by type
    b) No Sales
    c) Cancelled transactions
    d) Revenue per ticket
    e) Cash revenue per ticket
    f) Trending data is shown as a percentage of the individual cashier's activity.
    g) Trending data is shown as a percentage of each ticket type processed by all cashiers.
    h) Trending can be sorted by cashier name and/or shift.
15) **Cashier Performance Trend Analysis Summary–** Provides a graph of mean monthly Cashier Performance activity.
16) **Validation Report –** Provides a summary of validations processed (revenue and number of transactions) by account type.
17) **Detailed Validation Report –** Provides a chronological listing and grand total (number and dollar amount) of each validation transaction processed by account, cashier, lane ID, or another other report field to be used for invoicing support documentation.

18) **Monthly Bank Reconciliation –** Shall reconcile data from the Deposit Detail report from the banking institution, Credit Card reconciliation report from the credit card companies, and Returned Check Listings report.

19) **Annual Report –** Shall provide all of the information currently in the Annual Report.

20) **Congressional Tag Audit –** Shall summarize data captured by the cashiers. Reports shall include a summary report, a detail transaction report and a detailed tag report.

a) The summary report shows the total number of transactions, total parking fee amount, total validation discount amount, and total fee paid for each tag.

b) The detail transaction report shows each transaction using a congressional tag. This report can be generated for a selectable time period and display the transactions for selectable lanes/facilities/date of transaction in chronological order or by tag number.

c) The detail tag report provides all transaction related to a specific tag number for a selectable time period. The report shall be sortable by date/time, facility, or lane.

21) **Revenue Deposit Reconciliation –** Shall allow management to reconcile the entry of the cash deposits of each shift. The report includes the PRCS cash totals and computes the cash over/short for each shift. The over/sort data is also included in the daily revenue report.

22) **DCA Parking Reconciliation –** Shall reconcile data from the following:
   a) Revenue Deposit Day to Day for Month
   b) General Ledger data
   c) Bank reconciliation data
   d) Manual Bank reconciliation data
   e) Bank Statement

   Please provide samples.

23) **LPI Discrepancy Report** - Shall provide transaction number, location, time and date when on-line LPI check displayed larger fee than ticket due to LPI entry time. The report will allow the user to filter and print all active license plate numbers that are older than a user defined date. The LPI report will generate a report of all dropped plates with duration of stay greater than a user defined date.

24) **Monthly System Performance Report –**
   a) The monthly report shall consist of the following:
      i. Number of problems experienced during the month
      ii. Aggregate down-time as a result of the problems
      iii. Date and time problem was reported
      iv. Date and time maintenance personnel arrived
      v. Date and time problem was resolved
      vi. Date and time maintenance personnel departed
      vii. Number of hours maintenance personnel were on site
      viii. Number of items resolved during the month
      ix. Number of items outstanding at the end of the month
   b) Each monthly report will be submitted with a summary comparison against the previous month's report.

25) **Occurrence Summary** - Based on the desired reporting (daily, weekly, monthly, annually, etc.) the Occurrence Summary Report shall provide the frequency of occurrences in various subassemblies and modules with the occurrences classified into the causes or action taken. Totals for each type of sub-assemblies, modules, and maintenance actions and causes shall be provided.

26) **Daily Event Log –** The ability to filter events by type for a selectable time period and selected facilities and/or devices. It shall include print communication messages, facility lane equipment alarms, remote gate opening, and system log on/offs. The event log shall include the ability to create a listing of changes to the system and users who made changes.

27) **Peak Occupancy by Area –** Shall allow user to select peak occupancy by facility or a total of all facilities. Report shall show the peak occupancy for each hour of the day and each day of the month. The report shall also compute the monthly average peak occupancy for each hour of the day. In addition, the peak occupancy reports shall provide such data in number of vehicles present or as a percentage of vehicle present to total spaces available.

28) **Occupancy Report –**Reports counts by transient and credential parkers present on a selectable time increment (15 minutes, hourly etc.) basis by group, lot and total occupancy. Track occupancy and report peak occupancy during each hour. Provide for reports to show daily and/or weekly peak occupancy by access level, group and lot.

29) **Lane Activity Report –** For each exit lane, provide a summary of revenue by rate type and number of normal and exception transactions by rate type. This report provides trend analysis of transactions by type.

30) **Lane Volume Report** - Shall provide entry and exit counts by date by category (i.e. ticket, access card, etc.).

31) **Exit Totals and Revenue –** Shall allow user to select exit counts for lane(s) or facility(ies) for a selectable time period. The exit counts show total exits each hour by exit type (i.e. payment, access card, non-revenue card) and also the grand total of all exits by hour. The report shall compute the average number of exits per hour for the time period displayed in the report.

32) **Landside Operations –** Shall summarize data from the following sources:
    a) Revenue Summary report
    b) Monthly Report - Blue Shuttle
    c) Monthly Report - Taxi
    d) Monthly Report - Rentals

33) **Parking Revenue, Exits and Expenses –** Shall summarize data from the Monthly Report.

34) **Duration Report –** Provides duration of stay based on patrons' elapsed parking time and patron time of entry. The report will be available in 15 minute, 30 minute, hour, and day intervals for a selectable time period for each facility. A report shall also be available that provides an average duration for all facilities combined.

35) **Rate Increment Report –** Provides a summary of the activity (revenue and number of transactions) by rate increment for a selectable time period and/or by day of the week (Sunday – Saturday).

36) **Configuration report** - This report shall provide information on the configuration and version of all hardware and software elements of each individual device.

37) **Data transfer report** - This report shall identify the devices that have sent and received data, problems associated with the data transfer, and the time of the last connection.

38) **Ticket Sequence Report –** Provide a complete sequence of transactions related to individual tickets (i.e., information about how and when ticket was issued shall be tied to how and when fee was paid and ticket was processed).

39) **Monthly Ticket Value Report** - Provide ticket stratification based upon value of all transactions processed. Breakdowns shall be provided for each rate structure and by selected facilities. This report is used for revenue analysis, rate analysis, management planning, and statistical information.

40) **Outstanding Ticket Report –** Provide a listing of tickets that have been issued but are not yet processed at an exit for a selectable time period. Data can be sorted by ticket number, entry date, and ticket dispenser number.

41) **Stolen Ticket List –** Provide a list of stolen tickets issued by ticket dispenser for selectable time period. The report can be sorted by facility, lane, time dispensed. Provide a chronological list of stolen tickets processed by exit lane or Cashier for selectable times.

42) **Count Reports**
    a) **Entry Lane Report –** Provides the number of transient (i.e ticket) and credential entries for lane(s), facility, and total parking system for each day of a month, with a monthly total provided.
    b) **Entry Lane Comparison Report –** Compares number of entry lane transactions to historical activity.
    c) **Exit Lane Report** - Provides the number of transient and credential exits for lane(s), facility, and total parking system for each day of a month, with a monthly total provided.
    d) **Exit Lane Comparison Report –** Compares number of exit lane transactions to historical activity.

e) **Average Activity Report –** Provides the average number of transactions by selectable category for a selectable time period and for one or more parking facilities (selectable groupings) or one or more lanes.
f) **Overnight Stay Report –** Provides the number of transient and credential vehicles remaining in the parking facility for a selectable point of time in the evening. Shows the occupancy level each day of the month with a monthly total and average.
g) **Lane Activity Report –** Provides a summary of entry and exit transactions by type (transient and credential, and selected exception events) for each facility and system total.
h) **Unaccounted Ticket Report –** Provides a daily reconciliation of entries, exits, and occupancy counts for a specific point in time. This computation is compared to the daily inventory to determine the number of unaccounted tickets.

i) **LPR Reconciliation to LPI –** Provides a daily reconciliation of LPR to LPI showing records from LPR exits are removed from LPI.
j) **LPR Orphaned Transactions –** Provides a list of LPR entries older than a selectable date.

2.3.13 Auditing and Revenue Control Requirements

The vendor will provide the following features to maximize revenue protection.

1) **Counters –** the PRCS will have external physical counters and loop/PRCS counts as follows:
    a) **Physical counters -** The following devices will have a physical, non-resettable counter mounted inside the device. The counter will be easily visible without requiring the device to be opened.
        i. Ticket dispensers - Each time a ticket is dispensed the counter will increment by one.
        ii. Gate at entries and exits - Each time the gate is raised the counter will increment by one. This includes gate raises from regular activity as well as gate raises, gate locked up, and gate vends from the Facility Monitoring PRCS.
        iii. Cashier terminals – Each time a transaction is processed by a cashier terminal the counter will increment by one.
        iv. Exit stations - Each time a transaction is processed by an exit station the counter will increment by one.
    b) **Loop/PRCS counts**
        i. The SCS (see Section 2.4) maintains counts for each entry and exit lane and shows number of transient, credential, and total for each lane.

ii. The SCS maintains non-resettable ticket counts for transient entries and provides the beginning and ending ticket count number per lane for a selectable time period.
iii. The SCS stores counts of credential, transient, and total parking patron occupancy. It displays current occupancy by category. It stores peak occupancy by category for each hour and each facility.
iv. The SCS stores lane, facility and loop counts. This data will be available for specialized reports to analyze lot utilization and activity levels for selectable time increments (minutes, hourly, daily, etc. intervals).
v. Transaction Counts: The SCS compiles, compares and displays three separate counts related to each transaction.
    1. At entry lanes the ticket dispenser count is compared loop counts and gate vend counts.
    2. At exit lanes, compiles, compares and displays cashier terminal or exit station transaction counts, loop counts and gate vend counts.
vi. The SCS correctly increments/decrements in cases of illegal entry/exit for each lane.
vii. When the gate is locked up, the SCS will continue to operate and show these as separate "gate locked up" counts.

2) **Loops –** Loops will employ directional logic. Directional logic requires the loops be activated in sequential order without reverse movement. For example, in a three loop system, there are three loop activation patterns that will result in a directional logic violation: (1) A-A; (2) A-B-A; (3) A-B-C-B-A.
    a) At counting points not associated with gated entry/exits, dual loops with directional logic will be employed.
    b) At all other locations a single activation loops with separate closing loop will be provided. Directional logic will be maintained.
    c) At all other locations a single activation loops with separate closing loop will be provided. Directional logic will be maintained.
    d) The PRCS will provide directional logic where A-B-A and A-B-C-B-A loop activations mark the ticket as invalid. If the ticket is removed from the dispenser the ticket will be coded as a stolen ticket. If the ticket is not removed from the dispenser the ticket will be ingested and coded as a back-out. Note: Specification discusses directional logic and stolen/back-out ticket functionality, but doesn't specifically require ABCBA logic.
3) **Over/shorts**
    a) After shift revenue is counted, the PRCS will allow an authorized user to enter cash collected into the PRCS. The PRCS will include cash over/short in the daily revenue report.

b) The PRCS will track cash over/shorts by cashier id and users can select some or all cashiers for a user defined time period to see cash over/shorts by day, with a total at the end of the report.

4) **Events Journal**
   a) The Event Journal will record PRCS activity and record the event description, date, time, shift, facility ID, lane ID, device ID, and user ID, and reason for each event.
   b) The PRCS will provide a report for a selectable time period that can be sorted by any of the data fields listed above.
   c) The PRCS will record the user id, date, time, location and reason for all configuration changes to the PRCS.
   d) The Events Journal will be able to be sorted by event description, date, location, and user id. Common events sorted for audit purposes include manual gate vends, stolen tickets, and device offline/online activity.
5) **Data Storage**
   a) Data will be available for five years on the live PRCS and be available to generate all PRCS reports for a period of five years before being archived.
6) **Offline mode**
   a) Specification doesn't state offline transaction storage capacity. MWAA IT wants 24 hrs – industry doesn't set it this way. Done by number of transactions. How many transactions average in 24-hr period?
   b) Credit card sales will be accepted for a programmable limit. Once online the credit card transactions will be automatically sent to the clearinghouse.
   c) Declined off-line credit card transactions will be automatically resubmitted when the system is back online.
   d) An automated report listing all declined off-line credit card transactions will run on a user-defined schedule. The report will list how many times each credit card number has been declined in off-line mode.
   e) Field devices will provide the following options for processing credentials in offline mode:
      i. Allow all credentials to enter and exit.
      ii. Allow no credentials to enter and exit.
      iii. Allow credentials with a matching facility ID to enter and exit.
      iv. Anti-passback is disabled during offline mode.
      v. When the system returns to online status:
         1) The credentials tied to a credit card transaction will be automatically sent to the clearinghouse.
         2) The transactions (entries and exits) will be automatically sent to the database when back online.

3) The credentials will be reset to neutral and automatically activate anti-passback upon first use.

vi. The PRCS shall retain the number of transactions generated in a typical twenty-four (24) hour period, and have the ability to detect uploaded and left behind transactions when offline.

f) LPR Offline Functionality – need to complete and should include how orphaned transaction due to offline mode transactions are handled.

7) **Credentials**

a) For transactions using anti-passback, a vehicle must be on the loop for the credential to be read. The system must be programmed to read all credentials presented to the reader during a tailgating situation. This means that a break in the loop read must not be required for another credential to be read.

b) All administrative actions are password protected and recorded as events.

c) Allow authorized user to access all credential activity including assigning user credentials, activating/de-activating and blocking/un-blocking credentials, invoicing, etc., without having access to other modules of the PRCS software.

d) Anti-Passback Features - require users to enter and exit in proper sequence (i.e entry, exit, entry, exit, etc.). Allows hard, soft and no passback set by credential, group, or facility.

e) Maintain an account history for credential numbers that are deactivated and later re-assigned.

f) Provide the following credential reports:

i. Credential Reconciliation Report – For a selectable time period (typically one month) this report reconciles the credential sales (quantity issued and dollar amount) to the credentials that are activated in the system. This can only be done if the owner uses the PRCS credential invoicing package.

ii. Detailed Credential Reconciliation Report - Provides a chronological listing of each individual credential sold with a total that agrees to the Credential Reconciliation Report total.

iii. Activity Usage Report – Provide a chronological list of credential usage and includes date, time, card number, and location of entries and exits. Data will be capable of being sorted by date, time, card number, card type, and entry/exit lane.

iv. List of Active Credentials – a listing of all credentials that have access into or out of facility whether they are owner, courtesy maintenance, or revenue generating. Report will be in numerical order, include sum total of all active cards, and can be generated

on demand. Report and totals can be sorted by card type as well. Report is used to compare revenue generated to active credentials.

v. Passback Violations Report – Provides a list of passback violations in chronological order for a selectable facility, lane, device ID, credential number, company/department, dates, etc.

8) **Test Transactions**
   a) Provide a way to identify test transactions and exclude from database for reporting and statistical purposes.
   b) Provide a feature to test fee structure changes to ensure that the fee schedule changes are correct.
9) **Failure rates of control system** – system will report failure rates for each device – minutes down and % downtime.

2.4 SPACE COUNT SYSTEM (SCS)

2.4.1 General Requirements

The Contractor shall provide and install a parking SCS as indicated in these specifications. The SCS shall serve as an operational tool for maintaining a current count of the number of available parking spaces within each parking level of both Garage A and Garage B/C as well as the overall counts for each facility as a whole. The SCS shall consist of the loop located on each garage level and each entry/exit lane for detecting vehicular movements relative to entering and exiting a parking facility.

The vehicle count inputs shall be transmitted to the central server that will process the data on a real-time basis. The processing shall consist of adding, subtracting, and comparing the respective vehicle counts against a predetermined number of parking spaces available within each parking level of the garage. The purpose is to determine the actual number of vehicles parked on each parking level or area, or conversely, to establish the number of available parking spaces.

1) The SCS maintains counts for each entry and exit lane and shows number of transient, credential, and total for each lane.
2) The SCS stores counts of credential, transient, and total parking patron occupancy. It displays current occupancy by category. It stores peak occupancy by category for each hour and each facility.
3) The SCS stores lane, facility and loop counts. This data will be available for specialized reports to analyze lot utilization and activity levels for selectable time increments (minutes, hourly, daily, etc. intervals).
4) Transaction Counts: The SCS compiles, compares and displays three separate counts related to each transaction.
   a) At entry lanes the ticket dispenser count is compared loop counts and gate vend counts.
   b) At exit lanes, compiles, compares and displays cashier terminal or exit station transaction counts, loop counts and gate vend counts.

5) The SCS correctly increments/decrements in cases of illegal entry/exit for each lane.
6) When the gate is locked up, the SCS will continue to operate and show these as separate "gate locked up" counts.

The SCS shall provide the following:

1) GUI, real-time interactive displays of the space availability status
2) Control of the status signs within the garages
3) Integrated with the PRCS for activity reporting

The SCS shall be fully automated with no operator intervention required under normal operating circumstances. While in operation, there shall be allowance for manual adjustments and override of the SCS via the workstations, including, but not limited to:

1) Establishing the initial number of parking spaces in each parking area.
2) Setting parking space variance values.
3) Manual control of the full signs.
4) Adjustment of the number of spaces in each area.

2.4.2 Software Requirements

The Contractor shall provide all software (complete with documentation) for this system including controllers and remote I/O modules.

The software shall provide real-time counting, control, and display. It shall be possible to access management reports without interrupting real-time operations of the SCS.

2.4.3 Workstation Functions

All data required to monitor, control, and adjust the SCS shall be available on a designated workstation. The screen format shall be designed for the ultimate parking configuration (layout). All screen formats for the SCS shall reflect the physical layout of the Airport for ease of associating the displayed data with physical locations. Any change in the proposed screen format shall be subject to the Authority's approval.

The Authority shall determine the initial number of vehicles that a parking level or facility will accommodate. It shall be possible for the Authority to adjust the total parking spaces for each level or facility.

In the event vehicles continue to enter a parking level after the "Full" sign is activated, a warning indication on the workstation's display shall be activated. This indication shall cause the SCS to record negative spaces occupied. As vehicles exit a parking level or facility, the negative spaces occupied shall decrease until the spaces occupied is less than the designated full number. The workstation's display shall be updated in real-time.

It shall be possible to inventory the parking area and provide an exact count of the vehicles within the parking area or facility. Provisions to enter this information into the SCS will be included. This permits the Authority to account for any measurable errors

over time associated with the counting sensors.

2.4.4 Design Requirements

The SCS shall be designed and manufactured to accommodate all spaces within the garages and other facilities regardless of how those spaces are assigned. The central controller shall have sufficient input-output ports and interfaces to receive the inputs, communicate with, and control all loop, status signs, and other devices for all garage levels and facilities. The system shall be capable of space control and detection of a 200% expansion of the number of parking spaces and ingress/egress points.

The SCS shall operate in real-time with the PRCS. The entry and exit signal shall be received within one second from the event and appropriate displays activated.

The software shall provide the following:

1) Real-time graphical displays of the garage levels and other facilities with the number of available parking spaces or spaces occupied - immediate user identification of count status
2) Alarms to notify when a facility is "full"
3) Alarms of any component failures
4) User access levels with password restrictions
5) Functions with Windows operating system
6) ODBC, SQL compliance

2.4.5 Operational Procedures

The operational procedures relating to vehicular movement for space counting purposes are specified in this section. The term "vehicle count" and "spaces available" are commonly used to describe the same activities. "Vehicle Count" shall be the specific event when a vehicle is detected and counted when entering or exiting a parking level's or facility's control points. "Spaces Available" is defined as the spaces remaining in any given area resulting from the number of vehicle counts affecting the availability of any specific area within the parking facility.

Status signs shall be located at all up and down ramps and at the entrance to a facility. The display on these signs shall be controlled by the SCS. The number of available spaces on each level shall be automatically displayed indicating whether there are parking spaces on the parking level or the parking area. The Authority shall have the capability to override the status displayed and to change the predetermined occupancy number that triggers a change from one sign display to another.

For each parking facility, the system shall receive input counts from a designated loop/loop at each entry lane. As a vehicle enters the parking area, the vehicle's entry movement shall be detected and cause a signal to be dispatched to the SCS. The SCS shall record the event and decrement by a count of one the number of parking spaces available

within the facility. At an exit lane, the vehicle's movement through an exit lane shall be detected by a designated exit lane loop/loop system and increment by a count of one the number of available parking spaces within the parking facility. Directional logic shall be employed to detect illegal entries, exits, and backouts and will increment and decrement correctly for entry and exit lanes.

In Garage A and Garage B/C, a vehicle's movement on a ramp between parking levels shall be detected by the loop/loop system. The vehicle's movement shall cause a signal to be dispatched to the SCS. The system shall decrement by a count of one the number of parking spaces available within the level just entered and adjust the Parking Level Status sign.

As the vehicle exits a parking level, the vehicle's exiting movement shall be detected by the loop/loop system. A signal shall be dispatched to the SCS that shall increment by a count of one the number of available parking spaces within the parking level just exited. A vehicle traveling down ramp and entering a parking level shall be detected by the loops/loop. The SCS shall record the event and decrement by a count of one the number of available parking spaces within the parking level just entered. The vehicle's exiting the parking level shall follow the scenario previously discussed.

As the vehicle exits the facility, the exit lane's loop/loop system shall detect the vehicle's movement and cause a signal to be sent to the SCS. The SCS shall record the event and increment by a count of one the number of available parking spaces within the parking facility.

The Contractor shall provide and install a complete Parking SCS for the Airport's parking facilities. The lot "Full" signs included as part of the PRCS specification shall be integrated within the Parking SCS. "Spaces Available" signs shall be provided by the Contractor as part of the Parking SCS. The Parking SCS shall provide accurate counts to within ± five (5) vehicles per level and per facility. The Parking SCS accuracy shall apply to a 24-hour period.

2.4.6 Parking Space Count Signs

All signs associated with the Parking SCS shall be visible under all ambient lighting conditions. The Contractor shall obtain approval of sign type and size prior to placement within the garages. Parking signage requirements are defined in Appendix XX.

After passing through the entry plaza of a garage, a patron shall see a parking space availability sign on the approach to the up ramp and again upon entry onto each level. The Parking Level Status sign shall indicate whether a parking level has parking spaces available (the number of available parking spaces displayed in green lettering on a black background) or that the parking level is full (a full condition indicated by "0" in red lettering on a black background.) The number of parking spaces available that is displayed on the sign shall originate from the Parking SCS.

2.4.7 Parking SCS Provisions

The software shall provide:

1) Control of the parking level, lane status, and Parkade 'Space Available' signs within 2-4 seconds from entrance/exit event detection
2) Workstation display allowing:
    a) Status of all lots including space use/available counts
    b) Operating status of all sensors
    c) Operating status of all displays
    d) Display of summary statistics of parking space availability by specified date/time period
    e) Capability of manual correction or reset of counts
3) Daily maximum and minimum counts for each parking level or entire facility
4) Hourly flowrates through entries and exits
5) Control of the full signs on each parking level (a garage level shall be considered "full" when the number of parking spaces available is less than a defined number that is adjustable by the Authority. The Airport shall have the ability to manually "close" a garage level by overriding the displayed number of parking spaces available.)

2.5 LICENSE PLATE RECOGNITION AND INVENTORY REQUIREMENTS

2.5.1 Cashier Terminal

License Plate Inventory (LPI) or License Plate Recognition (LPR) checks. There will be a programmable option for an LPRI (License Plate Recognition or Inventory) check on each transaction or on exception transactions only.

1) LPI check –
    a) The operator inserts the parking ticket and the cashier terminal asks for the license plate number and defaults the state.
    b) A drop down screen is provided for other state choices.
    c) After the correct information is entered, the cashier terminal compares the ticket entry date & time to the LPI entry data (date of first presence) and displays the larger of the two fees on the cashier terminal and customer fee display.
    d) Discrepancies between ticket entry date & time and the LPI database entry information are reported as an exception in the database.
    e) When a cashier is required to enter a license plate number and state, the PRCS will display a list of matching plates in the LPI after a programmable number of digits have been entered. With each successive digit, the PRCS will update and display a list of matching plates until the last digit is entered, or until the operator selects a matching plate from the list. Once a plate number has been used to

complete a transaction that plate number will not be able to be used in another transaction, except with supervisor over-ride, until it re-enters the facility at an entry lane.

Allows remote supervisor transaction approval for user selected exception transaction types. The authorization can be entered at the cashier terminal or from another cashier terminal, computer, or workstation. When a cashier terminal requests authorization, an alarm is sent to a programmable designation for the authorization. The alarm includes the transaction information. The user ID responding to the authorization request is recorded as part of the event.

1) Customer Information Screen - Allows customer information to be entered into the cashier terminal in place of paper forms. The customer information can be tagged as a processing requirement for selected transactions types (usually lost ticket and insufficient funds transactions). The data fields required for completion of a transaction is selectable for each transaction type. Customer information entered into the PRCS is stored in the database and can be retrieved based on any of the fields listed below and also by Cashier id. The customer information screen includes the following fields (selectable mandatory fields and mask unused fields):
    a) Last Name
    b) First Name
    c) Drivers License Number
    d) License Plate Number
    e) State of License Plate
    f) Date of Birth
    g) Address
    h) Phone Number
    i) Entry date & time (required if LPRI is not available or is not found in the LPRI database)
    j) If LPRI is available, the option is available to bypass the customer information screen and instead enter the license plate number and state (automatically read for LPR) to compute the parking fee and past occurrence based on vehicle license plate number.
2) Customer History Function
    a) When an operator completes a customer information screen, the database searches by driver's license number (can be another field or even two fields, but the drivers license number has been successful, followed by the license plate number) for past occurrences.

b) All past occurrences that are programmed to appear are displayed on the cashier terminal with the primary sort being the transaction type and the secondary sort being the transaction date, in descending order.
c) Past occurrences can be programmed to not appear on the cashier terminal beyond a selectable date/year.
d) Past occurrences transactions can be removed from the active database for report generating to keep information manageable (if can generate reports for selectable dates, this is not needed).
e) Display of past occurrences can generate an automatic alarm, an additional fee, or require a supervisor's approval to proceed for occurrences exceeding a programmable threshold. Or it can simply be informational and handled outside of the PRCS.
f) Provide an optional message for the cashier to contact management instead of displaying past occurrence history.

3) Exception Transactions - The cashier terminal will provide individual keys or codes for each type of exception transaction that is also sortable for reporting purposes. An exception transaction is defined as any transaction requiring a form of cashier intervention (i.e. not an automated ticket). Exception transactions include but are not limited to:
    a) Lost ticket
    b) Unreadable ticket
    c) Stolen ticket
    d) Backout ticket
    e) ISF transactions
    f) Handicap parking - parking is provided for a disabled parker that presents proper disabled credentials.
        i. The operator selects the disabled permit feature and is asked to enter the permit number and vehicle license plate number. The state defaults and provides a drop down of state codes to select
        ii. The cashier terminal computes the parking fee and displays to the operator and on the customer fee display
        iii. The transaction proceeds
    g) Validations (must be sortable by type)
    h) Voids/Cancelled transactions
    i) Towed & Impound vehicles – tow key should have ability to process two vehicles: one tow truck and one customer vehicle. Provide a tracked and reported method for the operator to process two tickets with only one vehicle present when a tow truck presents both the tow truck's ticket and the hooked vehicles' tickets. Both tickets should be automatically processed (no manual entry of date and time required), both parking fees should appear on the cashier terminal separately with a total fee due

displayed on the cashier terminal and the patron fee display. If available in the PRCS, LPRI checks should be available for both vehicles to compute parking fees.

j) Split Transactions - The customer can use two payment methods (or two credential types) to process one transaction. This includes but is not limited to two credit card types or cash and credit card.
k) Non-revenue badges (separate keys for regular and VIP) – want badges read by cashier terminal, not manually input of badge number. Also want badges to be read at non-staffed exits.
l) Disputed – Supervisor approval is required.

4) ISF - If a parker does not have a method to pay the full parking fee, the operator will select the insufficient funds feature. This feature offers an option to require higher level approval before proceeding. The cashier terminal displays the customer information screen. The operator enters the customer information and the amount the customer paid. The PRCS determines the unpaid amount and records it as an exception transaction. The receipt printer generates three receipts as follows:
    a) One regular customer receipt
    b) One customer receipt that includes:
    c) Entry date & time
    d) Exit date & time
    e) Total parking fee
    f) Amount paid
    g) Method of payment (cash or credit card with last four digits and last name)
    h) Payment instructions
    i) One file receipt that includes:
    j) Customer name
    k) Address
    l) Phone number
    m) Drivers license number
    n) License plate number
    o) Entry date & time
    p) Exit date & time
    q) Total parking fee
    r) Amount paid
    s) Method of payment (cash or credit card with last four digits and last name)
    t) Agreement to payment terms
    u) Customer signature line

v) The operator collects payment, has the customer sign IOU agreement, and gives the other two receipts to the customer.

5) Foreign Ticket - Provide the ability to process a foreign ticket. An example where this is permitted occurs when a vehicle is parked in parking facility #1, is towed and impounded at parking facility #2, and uses the ticket from facility #1 to exit. The cashier terminal allows the operator to select the facility where the foreign ticket originated and computes the fee using facility #1's rate structure.
6) No Sale - Activation of a no sale key opens the cash drawer. These activations will be recorded in the database as an exception transaction and the number of activations will appear on the shift report and also recorded as an event. Record shift start, shift end, and breaks, which activate the cash drawer, as something other than "No Sale" events in the PRCS.
7) Manual Gate Vend - The PRCS will not allow an exit gate to vend without a transaction processed in the cashier terminal unless there is a gate vend function by an authorized user that is not a cashier.
    a) The cashier terminal will allow an authorized operator to vend the gate either in the lane or in another location.
    b) The manual gate vend will be recorded as an exception transaction and appear in the shift report.
    c) The manual gate vend will be recorded as an event.
    d) Provide a field to enter the reason for the manual gate vend.
8) Refunds – The cashier terminal and PRCS will not allow credit card refunds to be run through the PRCS.
9) Credit card PRCS must be integrated with the cashier terminal.
10) Programming Options:
    a) The PRCS can accommodate two cash drawers (one regular and one relief drawer).
    b) The cashier terminal has a selectable option requiring the cash drawer to be closed before another transaction can be processed.
    c) The cashier terminal has a selectable option to automatically print a receipt or only print on request.
11) The cashier terminal will have a selectable option to have tickets ingested into the validator box, or returned to the operator. This selectable option can be assigned to each ticket type.

2.6 LICENSE PLATE INVENTORY

The Authority requires an overnight License Plate Inventory (LPI) system that uses manual data entry to add vehicle license plate numbers to an LPI database and a manual lookup for the cashier's use at exit. The LPI system will be used to assist in the calculation of parking fees due to lost tickets until the LPR system is deployed later. When the LPR system is operational, the Authority will retain the LPI to facilitate

customer service activities such as assisting patrons locate a lost vehicle.

2.6.1 General Requirements

The Contractor shall provide equipment and software modules to complete the overnight inventory process within a four (4) hour time window. This time window includes the inventory taking process, correction cycles, and generation of an updated current overnight inventory. At a minimum, the Contractor shall provide the following:

1) Ten (10) handheld devices shall be rain and dust resistant, capable of completing the inventory taking process without having to recharge the batteries for an eight hour cycle, unaffected by inadvertent dropping on pavement from a height of four (4) feet, and contain inventory application specific software. The handheld inventory devices shall be menu driven and user friendly to operate.
2) One charging unit for each of the handheld devices.
3) The handheld device's software shall record the beginning and ending dates/times for the inventory taking process and shall cause these to be recorded on the Daily Event Log each time that the uploading process begins.
4) License plate inventory system software database shall reside on the PRCS Servers.

2.6.2 Inventory Device Functional Requirements

1) Each handheld inventory device shall be capable of being used in any of the Airport's parking facilities. Through a user selectable menu, the Inventory Taker shall select the appropriate parking facility for inventory taking. It shall be possible for the Authority to add, change, or delete from the menu choices parking facilities to be inventoried. The parking facility designator codes shall be a minimum of five-characters. The software shall have the capacity to triple the number of parking facilities to be inventoried. Each handheld unit shall be able to accept all the inputs necessary to inventory a minimum of 6,000 parking spaces.

2) The handheld inventory device shall be programmable such that the inventory taking process can be recorded by parking level or entire facility. It shall be possible to add to, change, or delete from the user selectable menu options, the number of parking levels or parking areas available within a parking facility. The parking level and area designator codes shall be a five- character field size. The programmable feature, to add, change, or delete a parking facility, parking level, or area within a parking level, shall be password protected and accessible only by the Authority.

3) The device's software shall also contain a time clock feature that records the time the overnight inventory taking process began and concluded. The time recording shall receive input from the on/off switch whereby if the inventory taker interrupts the inventory taking process the interruption is recorded.

2.6.3 LPI Process

The LPI Process shall consist of the following activities:

1) Inventory Procedures

   a) The handheld-equipped overnight inventory takers shall manually key into the handheld devices the vehicle license plate numbers. Automated LPN entry and mapping may be provided subject to the review and approval of the Authority.
   b) LPI units to be swappable so if one fails another one can be used for a different mapped route.
   c) Up/down loads should occur for all LPI units that are in cradle subject to the review and approval of the Authority.
   d) The handheld device's software shall contain data fields to enter the vehicle's license plate number and the appropriate province or state. The license plate number field shall be an eight (8) character field. The state field shall be a two (2) character field defaulted to "VA" for Virginia.

2) Uploading the Inventory Data

   a) Once the inventory taking process is completed, the handheld device shall be connected via a data cable to a workstation operating in conjunction with the PRCS. The inventory taker shall upload the current night's inventory to the PRCS Central Servers.
   b) Appropriate checks and balances shall be in-place to detect possible data entry errors. For example, if a previous night's license plate number was "AAB 112" and the current night's license plate number is "AEB 112," an Exception/Error Report shall prompt the inventory taker to confirm that the entry "AEB 112 is correct." The exception reporting process shall continue until a "clean" inventory is achieved.

3) LPI Procedures at Exit

   a) The Authority will continue to use the existing license plate visual confirmation system with the new PRCS, until the LPR system is operational.
   b) The cashier shall manually enter the number into the Cashier Terminal. The cashier shall have the ability to adjust the LPI camera in all directions and to zoom in and out. Upon entry, the license plate number shall be transmitted to the PRCS Central Servers. The PRCS LPI software shall conduct a search on an active inventory database for a correlation match. Upon a successful match, the entry information is communicated back to the Cashier Terminal. If no discrepancy exists between the information on the encoded parking ticket presented and the LPI database information, the cashier completes the transaction as discussed previously in these specifications.
   c) If a discrepancy exists between the parking ticket and the LPI database, with LPR offline, the cashier shall complete an exception transaction using the LPI database until the LPR database is back online.

d) Once a license plate number has been entered and matched, the license plate number shall be extracted from an active inventory database and placed in an inactive inventory database.

2.7 LICENSE PLATE RECOGNITION

Throughout this Section, the term "LPR database" shall refer to a generic database(s), which may be stored entirely or in part on PRCS Central Servers or on the LPR subsystem hardware. The location where LPR data is stored may be at the discretion of the Contractor providing that all data identified as being stored within this LPR database(s) shall be immediately accessible to the Authority for on-screen review and hard copy report printing.

2.7.1 LPR System Overview

Each public parking entry and exit lane at the Airport shall be equipped with the LPR subsystem. The LPR subsystem shall consist of all hardware and software necessary to provide a complete license plate reading subsystem that does not adversely affect any function of the PRCS. The Contractor shall be responsible for providing an LPR subsystem that is fully integrated with the PRCS.

All LPR subsystem processing shall occur in parallel with other functions occurring within the PRCS and shall not increase the processing time for vehicle entry.

2.7.2 LPR subsystem General Layout

The LPR subsystem shall consist of equipment located at the following facilities:

1) Garage A
2) Daily Lot A
3) Garage B/C
4) Economy Lot

2.7.2.1 Loops/Conduits

The Contractor's shall determine how much conduit, power and communication hardware, and/or trigger loops are necessary and hardware is required to provide an LPR subsystem to all lanes.

2.7.2.2 Camera Installation

Precise location of the camera equipment shall be per the Contractors Camera Installation Plan (CDRL 203) subject to approval of the Authority. Contractor shall be responsible to determine camera locations so that Authority defined performance requirements are attained.

2.7.2.3 UPS Connections

All LPR subsystem hardware installed at the entry and exit lanes shall be powered by the existing UPS hardware that exists at each lane. LPR subsystem hardware located

within the Parking Office and computer rooms shall be powered by dedicated UPS devices.

2.7.2.4 System Failure

If, in the unlikely event of total LPR subsystem failure, it shall be possible for the Authority to "turn off" the LPR subsystem so that continued normal operation of the base PRCS is maintained. This normal operation of the base PRCS system shall not require patrons to wait for the expiration of an LPR related timeout to process their transaction. Once the LPR subsystem comes back online, the Authority shall have the ability to "turn on".

2.7.3 Credit Card In/Credit Card Out LPR Integration

It shall be possible for the Airport's parking patrons to use a credit card at entry to gain access to the parking facility and then use the same credit card at an exit lane to pay their parking fee and exit the parking facility. This functionality shall be fully integrated with the LPR subsystem.

2.7.3.1 Vehicle Entry

At entry, the credit/debit card functionality shall allow the patron to use a credit/debit card to gain entry into the parking facility. Credit/debit card usage shall inactivate alternative entry functionality, ticket or access card. Only one transaction type shall be permitted for each entry event. The patron shall insert one of the Authority's acceptable credit card types into the ticket/card reader slot at the Entry Station or tag a contactless card.

The successfully processed card information including relevant entry information (e.g., entry lane, entry date and time) shall be transmitted to the PRCS database. Then a signal to the barrier gate to raise the gate arm to the raised position shall be dispatched. The patron then proceeds to enter the parking facility and LPR photographs of the vehicle LPN are processed.

2.7.3.2 Credit/Debit and Contactless Card Payment at a Cashiered or Automated Exit

The patron shall have been instructed to insert a ticket, insert a card via the patron faceplate display or tag a contactless card to the integrated card reader. The system shall detect that the information processed is a credit/debit card and conduct an LPR database search of active inventory. A successful match shall cause a signal to be sent to the PRCS active inventory and a parking fee shall be calculated, displayed to the patron, and charged to the patron's card. No signatures are required for amounts less than $200.

The PRCS transaction shall be deleted from the active inventory LPR database and added to an inactive inventory LPR database. Simultaneously, a TCM shall be dispatched to the license plate read subsystem to delete the license plate number from the active inventory and add that license plate number to an inactive inventory LPR database. A receipt shall be generated. The patron's extraction of the receipt shall cause the exit lane barrier gate arm to raise to the open position. The patron proceeds to exit the parking facility.

2.7.4 Unique Features and Requirements

2.7.4.1 Ongoing Operation

Installation of this LPR subsystem shall be accomplished without impact to ongoing operations. Except during Lane Acceptance Testing, LPR subsystem installation at all entry and exit lanes shall be accomplished while lanes are open to vehicular traffic unless otherwise approved by the Authority Project Manager.

2.7.4.2 Black List

The LPR subsystem shall keep a "Black" List of the following:

1) LPN's which identify vehicles whose owners have a history of problems at the facility.
2) LPN's which are known not to be unique across different states of registry.
3) LPN's of vehicles movements that are necessary to track as decided by the Authority.

Upon entry of any vehicle with LPN on the Black List, the LPR subsystem shall sound an audible alarm in the Parking Office until acknowledged by an operator. The audible alarm sound corresponding to the LPN's on the Black List shall be a unique sound used only for this purpose.

This Black List may reside on either the PRCS or on the LPR subsystem as determined appropriate by the Contractor.

Entry of LPN's onto the Black List shall be controlled by user id and password. LPN's shall reside on the black list until removal by the Authority. Entry of an LPN onto the Black List shall include the date of entry, reason for entry onto the Black List, authorizing supervisor, and comment section.

2.7.4.3 Gray List

The PRCS shall keep a record history of exception transactions. The LPR subsystem shall keep a Gray List that shall meet the functionality needs previously described in this Section. This Gray List may reside on either the PRCS or on the LPR subsystem.

2.7.5 LPR Subsystem Hardware

All LPR subsystem hardware shall be UL listed and all components and their installation shall comply with all laws, ordinances, rules and regulations of public authorities having jurisdiction over this part of the work.

2.7.5.1 System Redundancy

The Contractor shall provide full system and component redundancy so that no single failure of a device shall cause an operational failure. No redundancy is required at a lane unless common equipment is shared between multiple lanes. Equipment at a single lane may fail causing a shutdown of a lane; however, the failure shall not affect other lanes.

2.7.5.2 Cameras and Lighting

Image Capture devices and necessary lighting shall be placed at all entry and exit lanes. Devices shall be placed in theft deterrent housings that meets applicable code requirements for outdoor equipment. The location of each device shall be determined by the Contractor subject to approval of the Authority and defined in Camera Installation Plan (CDRL 203). All camera's and lights shall be installed with sufficient protection to prohibit damage from vehicular traffic, as defined in the Lighting Code Requirements List (CDRL 204).

2.7.5.3 Image Review Workstation

Three (3) Image Review Monitors (IRM's) shall be available. Each IRM shall provide an operator with the ability to review images for manual read and data entry into the LPR database.

The Authority shall be able to control which one of the IRM's will be used for image review for each parking facility. If the Authority selects that a single IRM be used for image review, all LPR images will be sent to that IRM for review. If the Authority elects, images shall be first sent to a single queue then be sent from this queue to the first IRM available after that IRM has reviewed and processed the preceding image. Exit transactions shall be given higher priority than entry transactions for review at an IRM.

2.7.5.4 Server's/Processor's

The LPR subsystem shall use two (2) clustered servers sized according to anticipated transaction volumes. The servers shall use the same database engine as the PRCS to store and process LPR transactions. If the same database engine is not available, the Contractor shall utilize an ODBC/SQL compliant database such approved by the Authority. The database shall be sized to keep an online active LPI of at least ninety (90) days and provide an online inactive LPI of records up to one (1) year. Only active inventory LPN pictures shall be maintained in the database. Records removed from the system will be recorded including the time and user making the deletion.

The two LPR servers shall be located in the Computer Room of the Parking Offices of Garage A. The LPR servers shall be setup with a single primary server, along with a second, redundant, LPR server that shall provide a fail-safe backup. This process shall be transparent to the applications and to the user.

2.7.5.5 Network Infrastructure

Communications with the parking entry and exit locations shall occur on a network that shall provide for latest industry approved speeds between the Image Capture Processor (ICP) and the LPR subsystem's servers and that shall not negatively impact functionality and operations speeds of the existing PRCS. The LPR subsystem shall run on its own independent network infrastructure with controlled entry points into the PRCS that shall allow the two systems to work in a complimentary manner.

2.7.5.6 System Workstations

The Authority shall be licensed to operate a minimum of five (5) workstations that shall be capable of performing all LPN resolution requirements. Two workstations shall be located in the Supervisors work area as described above. The other three (3) workstations shall be located at as-yet-underdetermined locations. The Contractor shall provide the specifications for the workstations (IRM's) to the Authority. The Authority will purchase the proper workstations and turn the workstations over to the Contractor for integration with the LPR subsystem.

2.7.5.7 Fiber Optic Cable

All communications cable associated with the LPR subsystem shall be fiber optic cable. The Authority shall provide the fiber optic cabling for the LPR subsystem. The Contractor shall provide the Authority with the necessary information to ensure the proper type, lengths, and size of fiber optic cabling is purchased.

2.7.5.8 Conduit

Additional conduit required to complete installations shall be installed in accordance with applicable local codes and standards. The Contractor shall submit design drawings stamped by an Engineer, licensed to practice in the Commonwealth of Virginia, showing proposed new conduit installations to the Authority for approval. Exposed conduit shall be protected from vehicular damage and shall not represent a trip hazard.

2.7.5.9 Uninterruptible Power Supply (UPS) Units

Individual UPS units for all lane equipment including the LPR subsystem hardware exist at each entry and exit lane. LPR subsystem hardware installed at each entry and exit lane shall be connected to this existing equipment by the Contractor.

New UPS support for LPR subsystem Server/Workstation system(s) not located at entry and exit lanes shall be provided and installed by the Contractor

2.7.6 LPR Subsystem Software

Software provided for the LPR subsystem shall be provided in accordance with the following sections

2.7.6.1 Source Code

The Contractor shall provide the Authority either:

1) All computer program Source Code (CDRL 205) used in the LPR subsystem and peripherals on CD- ROM, OR,
2) Place a copy of the Source Code (CDRL 205) used in the LPR subsystem and all peripherals in the control of a mutually agreed upon third party escrow provider (preferably the same escrow agent securing the PRCS software source code.) The Contractor shall pay for the cost of the third party escrow for the duration of the warranty period.

2.7.6.2 LPR Database Security

The Contractor shall provide secured access to all LPR subsystem related database(s). Access will be made available by user id and password.

2.7.6.3 Immediate Access

All data within the LPR database shall be immediately accessible for on screen review or printing via noted reports or with a "print screen" function. No impediment to the spontaneous and immediate access and retrieval of any LPR data shall result from use of shadow database(s) or any other system architecture, hardware, or software.

2.7.7 LPR Subsystem Testing

General Acceptance Testing requirements shall conform to those described in Section 4. Specific revisions to this Section are described below.

2.7.7.1 Factory Acceptance Testing

In addition to the requirements of Section 4, the Contractor shall provide samples of all screen views associated with the LPR software a minimum of 30-days prior to testing. These screen views to include samples of on screen data, which is illustrated to the user during preparation of exception forms, evaluation of LPR photos at the IRWS, and during any interaction by the end user/supervisor.

2.7.7.2 Lane Acceptance Testing

With the exception of necessary installations within the Parking Office, LPR hardware shall be installed and 100% tested and approved in three initial test lanes. These three initial test lanes shall consist of a single entry lane, a single cashiered exit lane, and a single express exit lane. The Contractor shall recommend for Authority approval, which entry and exit lanes shall receive the initial installations.

Testing of equipment at all lanes shall be in accordance with Lane Acceptance Testing (LAT) documents prepared and provided by the Contractor for Authority approval a minimum of 30-days prior to proposed start of the LAT.

The LAT shall be fully accomplished and approved by the Authority in each of the three initial test lanes prior to the installation of LPR equipment in any other entry and exit lanes.

2.7.7.3 Site Acceptance Testing

Site Acceptance Testing shall be in accordance with Site Acceptance Testing (SAT) documents prepared and provided by the Contractor for Authority approval a minimum of 30-days prior to proposed start of the SAT.

2.7.8 LPR Subsystem Performance Requirement

The LPR subsystem shall acquire a vehicle's LPN image at each public parking entry and exit lane at least 99 percent (99%) of the time. This accuracy percent shall be labeled

as unobstructed, unobscured and unencroached (having no foreign object within .375 inches (3/8") of LPN) license plate. Additionally, the LPR subsystem shall read all LPN characters, exclusive of stacked characters, correctly 85 percent (85%) of the time and will read all but two (2) LPN characters, exclusive of stacked characters, correctly 95 percent (95%) of the time.

At vehicle entry, the total elapsed time from the point a vehicle triggers the picture grab loop to the point where the LPR subsystem submits a valid LPN into the LPR database active inventory shall not exceed 2 seconds for any single event.

At vehicle exit, the total elapsed time from the point a vehicle triggers the picture grab loop to the point where the LPR subsystem communicates a successful or unsuccessful correlation message to the exit lane shall not exceed 2 seconds for any single event.

2.7.9 Technical Support Response Requirements

The response times for a single lane failure shall be less than four (4) hours all year round including holiday periods. The response times for system wide failures shall be less than two (2) hours all year round including holiday periods.

2. 8 LPR OPTIONS

2.8.1 Long Term LPR Maintenance Agreement

1) The Contractor shall maintain the LPR subsystem for five (5) years after the warranty period has expired. Use of Contractor provided post warranty maintenance will be at the discretion of the Authority.
2) The Contractor is requested to guarantee that annual maintenance prices shall be protected for a five (5) year period for the Authority. The maintenance service proposed by the Contractor shall be for Full Maintenance Service and shall include an on-site response time of two (2) hours or less, 24-hours per day, 7 days per week, and 365 days per year.
3) The Contractor shall provide a written preventative maintenance schedule for all elements of the LPR subsystem as part of the Full Maintenance Services.
4) The Full Maintenance Service shall include maintenance support for all equipment and software, including but not limited to, spare parts, materials, labor, software, testing equipment, tools, etc. necessary to fully support the LPR subsystem. The Contractor shall quote a price for each year as indicated on the bid price form.

2.8.2 LPR Equipment Per Lane Unit Price

The Contractor shall provide the Authority a firm fixed price for additional LPR units that will range between one (1) and twenty (20) units. This firm fixed price shall be good for three years, measured from the date this LPR Agreement is signed.

For the purposes of this paragraph, a unit is defined as all hardware necessary to provide functional LPR at an individual lane. Conduit and wiring connecting to the

individual lane hardware shall not be included with the unit cost and will be funded as part of a separately bid installation cost.

2.8.3 LPR Audit System

The Contractor shall provide a means by which the LPR subsystem LPI can be audited at the initial operational startup of the equipment and periodically thereafter.

The Contractor shall determine the specific audit method and shall meet the following specifications:

1) The entire audit process shall be capable of being accomplished in no more than two hours.
2) Handheld or radio devices used in the audit shall be able 100% reliable and useable in all sections and all levels of the existing parking structure.
3) Following the gathering of LPN's within the parking facilities, an operator shall be able to compare the audited LPI and the current automated LPR inventory.
4) Software shall be able to accommodate a minimum of 25,000 unaudited LPN's.

2.9 SPACE MANAGEMENT SYSTEM (SMS) (OPTION)

The Contractor shall provide a real-time SMS. The real-time SMS shall provide the capability to determine the degree of occupancy by garage section and by level. The SMS shall accept occupancy data from multiple manual or automatic data collection sources, such as occupancy detectors in each space or periodic transfer of LPI data files. The SMS shall provide the data outputs necessary to show the availability of spaces at the airports parking garages based on the data provided by the input data sources. If real time data is provided by any source of data input, the SMS shall update the messages displayed and any output, in real time. The SMS shall be scalable to include signs that show the number of spaces available in each row and drive a light over each individual available space.

The Contractor shall provide an SMS that integrates with the networked CDMS while equally capable of working in stand-alone (off-line) mode in case of a communication failure. Once communications is restored, the data collected by the remote sensors and servers shall be transferred and processed by the SMS. The SMS shall continuously monitor and check for availability of empty spaces and through appropriate messaging on signs, guide traffic to the empty spaces. The SMS shall utilize state-of-the-art detection technology for the presence detection in a particular space.

The SMS shall provide an open interface that will allow integration and data files to be exchanged with:

1) The PRCS for activity reporting
2) A parking reservations system provided by a third party

For all software requirements, refer to Section 2.4.2 (Space Count System)

For all workstation functions, refer to Section 2.4.3 (Space Count System)

For all Design Requirements, refer to Section 2.4.4 (Space Count System)

2.10 SYSTEM CONFIGURATION

The Contractor shall provide a Lane Control and Interface Processor (LCIP), also referred to herein as a Lane Controller, to accomplish the following:

1) Provide an interface between electronic devices
2) Provide a single point of interface at the entry/exit lane and coordinate/distribute all necessary signals
3) Distribute signals to the appropriate parking operator's office
4) Control the sequence of events based on programmed timing and sensor activities
5) Control devices such as lane closure signs
6) Provide failure alarms
7) Provide a common time synchronization point with the CDMS

The LCIP shall be certified by the manufacturer to operate reliably within the installation environment based on the environmental temperature changes. All metallic interfaces shall be Transient Voltage Surge Suppressed (TVSS) installed. The LCIP shall utilize a 10BaseT optical interface with the central Ethernet switch allocated to the central server. The LCIP shall utilize a standard, open-architecture bus supporting modular expansion.

The Contractor shall provide a barrier gate at the entry and exit lanes. The barrier gate shall be electronic with a raise and close time not to exceed 2.5 seconds each (five (5) seconds total). Upon receiving a signal, the LCIP shall generate a signal to raise the barrier gate.

A gate-closing loop shall (based on sensor selection, lane geometry and event timing) generate a signal to the LCIP to lower the barrier gate. The Contractor shall further integrate adequate sensors that can detect "back out." The LCIP shall report a "back out" condition.

A lane status signal shall also be integrated with the lane controller. A command is issued via the transactional server to the LCIP to close (or open) a lane. This is accomplished by an operator at the supervisor's office. A manual close switch shall be included at the LCIP that is accessible only by maintenance personnel. When activated (i.e., lane closed), a message is initiated by the LCIP to the supervisor.

All lane-related equipment shall be fully environmentalized when installed in the proper housing provided by the Contractor.

The equipment shall be electromagnetically compatible with other equipment at the Authority including radio frequency emissions. The equipment shall comply with Bellcore TR-NWT-001089 "Electromagnetic Compatibility and Safety of Equipment" and guidelines of EIA 647 "Requirements for the Control of Electromagnetic Interference Emissions and Susceptibility Characteristics of Equipment intended to Operate in Secure Electromagnetic Environments." The equipment shall not be susceptible to noise induced from the

emissions of EMI of high power radar, navigation aids, and radio equipment normally utilized at airports.

Access to all manual activation switches utilized for maintenance shall be controlled. Special keys shall be required for access to switches and electronic modules. An alarm shall be generated when the access door is opened and shall not be reset until it is closed. Alarm status messages shall be sent by all associated equipment via communication links to the supervisor's office for event logging and display. Logged information shall include parking facility, plaza, lane, specific alarm, date/time activated, current active status, and date/time deactivated.

All lane equipment performing a like function and of the same part number shall be fully interchangeable without the requirement for physical modifications.

3. PROJECT SUPPORT

3.1 PROJECT MANAGEMENT

The Contractor shall ensure that this contract is effectively and efficiently managed to the mutual benefit of the Contractor and the Authority. The Contractor shall employ as necessary the personnel, personnel hours, tools, and systems to manage and deliver the project. The Contractor will allow Authority representatives to work alongside the Contractor without exception.

3.1.1 Project Management Scope

The project management scope shall enable the Authority to ascertain with a high degree of confidence the current status of execution of the contract. The system and processes employed shall be detailed and inclusive to enable the Authority to actively monitor all project tasks.

The Authority considers an effective project management program to be capable of identifying and addressing program issues at the earliest opportunity in order to minimize or eliminate Change Orders and changes to the project plan or schedule. It is therefore incumbent upon the Contractor to have an established and fully effective project management program in place at the initiation of the contract.

3.1.2 Program Requirements

3.1.2.1 Project Manager

The Contractor shall establish a Project Manager (PM), subject to the Authority approval, who shall be responsive to the needs of the Authority as required by the contract. The PM shall ensure that the project tasks are completed on time and within budget. The PM shall coordinate design and engineering activities. The PM shall keep the Authority fully informed of the status of the project and shall promptly and regularly notify the Authority of any problems or difficulties that may impact the timely or effective completion of the task, milestone, or project.

The PM shall be competent and fully qualified in all aspects of the PRCS, the project, and the contract. The Contractor's PM shall have a Project Management Professional (PMP) certification.

The PM shall be replaced by the Contractor if determined to be unqualified by the Authority.

3.1.2.2 Project Management Program Plan

A Project Management Program Plan (CDRL 301) shall be submitted and approved by the Authority in conjunction with a Notice to Proceed (NTP). The plan shall be reviewed and modified as necessary during the execution of the contract. It shall be discussed and updated as required at the Conceptual, Preliminary and Final Design Reviews.

The plan shall include, but not be limited to, the following:

1) Outline of the overall Project Management Program plan
2) Project Manager responsibilities
3) Outline of Contractor organization structure
4) Outline of Contractor engineering organization
5) Outline of Contractor manufacturing organization
6) Preliminary program implementation plan
7) Preliminary installation organization, concepts and control

3.1.2.3 Project Schedule

The Contractor shall develop within five (5) days after the post award meeting a final schedule of all milestones and principal tasks with the required schedules of design, approval, manufacture, delivery, installation, and implementation of the project.

The Project Schedule (CDRL 302) shall include tasks assigned to the Contractor and the Authority, and shall take into account discussions at the post award meeting on the draft schedule previously submitted. The schedule shall be updated and submitted for review on a monthly basis.

3.1.2.4 Submittals

The Contractor shall establish as part of the Project Management Plan, procedures to track the status of all required deliverables. The Contractor shall maintain the schedule and status of all required deliverables, which shall contain the following information:

1) Contract Deliverable Requirements List (CDRL) number and suffixes
2) Title
3) Scheduled submittal
4) Actual submittal date and correspondence identification number
5) Action taken by the Authority and correspondence identification number

All submittals under each CDRL shall be shown. The report shall be updated and submitted not less than every thirty (30) days or as required upon the Authority request. In the course of the project, additional deliverables or action items may be identified as the responsibility of the Contractor. The Contractor shall maintain a record of such deliverables and action items and submit it to the Authority on a monthly basis, showing the status of all deliverables and action items, and persons/organizations responsible. See Appendix G for the CDRLs required.

3.1.3 Project Meetings

The Contractor shall participate in various project meetings throughout the performance of this contract as outlined in this section. The Contractor shall be in physical attendance. Unless otherwise approved by the Authority, all project meetings will be held on the Authority property at locations made available and provided by the Authority. The Contractor will make every effort to cooperate in the scheduling of meetings and shall provide the required information for the following meetings in a timely manner:

1) Project Kick-off Meeting
2) Project Status Meetings (bi-weekly)
3) Design Review Meetings (see Section 3.2)

Distribution will occur not less than five (5) business days in advance of each meeting date.

3.1.3.1 Project Kick-off Meeting

A project kick-off meeting will be scheduled and conducted by the Authority. The Contractor's Project Manager and key staff shall attend this meeting. Prior to the meeting the Contractor shall provide the following:

1) A list of all Contractor attendees
2) Preliminary Project schedule
3) Project Management Plan

The agenda will include, but not be limited to, the following:

1) Introduction
2) Review of responsibilities
3) Review of organization and sub-contractors
4) Questions concerning errors, ambiguities, and omissions in, and interpretations of specifications and drawings.
5) Change Order procedures

6) Documentation control procedures
7) Use of office, storage areas, construction areas, and temporary easements
8) Deliveries and priorities of major equipment
9) Safety, first-aid, emergency actions; and security
10) Sequence of critical work, and tentative schedule
11) EEO and affirmative action requirements and community relations
12) Insurance, laws, codes, traffic regulations, and regulations and permits

Provide description of Quality Control process, including problem tracking, resolution and reporting.

3.1.3.2 Project Status Meetings

The Contractor will participate in periodic Project Status (Progress) Meetings which may be scheduled or called as the Authority deems necessary to ascertain that work is progressing within schedule and in accordance with requirements of the Contract.

Progress meetings may be conducted via conference call at the Authority's discretion. Attendees shall be representatives of the Contractor and the Authority as required to support the agenda.

3.1.3.3 Implementation Meetings

The Contractor will participate in Implementation Meetings which may be scheduled or called as the Authority deems necessary to review project implementation and equipment installation tasks. The Contractor shall provide the Authority with a PRCS Equipment Installation and Removal Details (CDRL 305) plan. It is anticipated that these meetings shall begin after Final Design Review and will be scheduled as necessary to support implementation and installation task activities.

3.1.3.4 Status Reporting

The final format of a status report which aggregates the inputs from all parties shall be agreed between the Authority and Contractor prior to award of the Contract. The Contractor shall provide a Monthly Progress Report (CDRL 304) to the Authority.

In addition to status reports issued on an on-going basis, the Contractor shall implement a separate problem tracking, resolution and reporting system. Problem tracking and resolution report logs shall be provided to the Authority in the form of a Failure Review Process report (CDRL 308).

The degree of automation to be employed for this activity shall be agreed between the Authority and the Contractor, but regardless of the degree of automation, it shall perform the following functions at minimum:

1) The system shall assign numbers to problems as they are reported to enable accurate tracking.
2) Each problem shall be logged on the date reported.
3) The log shall be updated as the status of the problem changes, for example:
    a) Anticipated solution
    b) Date solution is to be provided
    c) Date solution was provided
    d) Date solution was tested
    e) Results of the test
4) Problems shall not be closed until the solution has been successfully tested and has been "signed-off" by the reporting entity and another responsible entity such as the Program Manager.

3.2 DESIGN REVIEW

The Contractor shall participate in Conceptual, Preliminary, and Final Design Review meetings with the specific objective to review and approve the Contractor's presentation of the preliminary system and final product design.

Design Review meetings shall be conducted to evaluate the technical adequacy of the design and the compatibility with the performance requirements of the Contract. Design review meetings are intended to serve as a technical review of Contractor progress toward meeting Contract requirements. At the completion of the review, the status of the review will be presented in the form of a statement of action items and schedule of accomplishment necessary to obtain the Authority concurrence with the program's technical progress.

3.2.1 System Configuration Management (SCM)

The Contractor shall establish a formal SCM process for the Authority to handle all system changes. These changes shall include any of the following:

1) Fixes: corrections of malfunctions ("bugs") that are required in order to meet performance and functional requirements as specified in the Specification.
2) Updates: new software releases provided by the Contractor, whether for application software, operating system software, or third-party software.
3) Enhancements: changes that provide improvement in the operation.
4) Modifications: changes necessitated by program changes.
5) Upgrades: augmentation and/or replacement of any system hardware.
6) Documentation revisions: updates to instructional documents or users' guides to reflect modifications to any existing software or other changes to the

Authority systems' functionality.

The SCM process shall include a strict testing procedure to be followed before any system change is implemented in production. This testing procedure shall include reporting of results and acceptance of test results to verify successful completion before implementation.

3.2.2 Design Review Process

The Contractor shall conduct three formal design reviews to evaluate the progress and technical, functional and programmatic adequacy of the design in accordance with the performance requirements of the Contract. Prior to each review, a design review package shall be submitted that includes CDRLs and other items required for the review. Design review packages shall be provided at least twenty-one (21) days before a design review meeting. Design reviews shall consist of the following key activities:

1) Design review package will be reviewed by the Authority staff.
2) An Issues List will be created as a result of the review and will be provided to the Contractor at least five (5) days prior to the scheduled design review meeting.
3) The design review meeting, or series of meetings, will be held between the Contractor and the Authority where issues will be resolved during the design review meetings.
4) Issues not resolved during the meetings will be identified and documented. The Authority will determine the appropriate action to close the issue, giving consideration to where the project is in the overall design review process. This may require resubmission of design review items.
5) The submittal will be approved, upon the Authority's determination that there are no open issues.
6) If there are open issues, the Authority at its discretion, may proceed to the next step or require the Contractor to address all outstanding issues prior to the next step.

Ten (10) copies of the submittals shall be provided prior to each design review. Each drawing submittal shall include a CD with the drawings in electronic format (.pdf) and one reproducible on regular paper.

The Authority shall have on-site access to drawings and other design and manufacturing information related to the PRCS system, including microprocessor source code and other proprietary technical data. The Contractor may establish suitable confidentiality agreements.

3.2.3 Conceptual Design Review (CDR)

The objectives of the CDR shall be to familiarize the Authority with Contractor's intended design and procurement activities, resolve external interfaces, confirm direction on options and provide the basis for proceeding to PDR. All Submittals required prior to the CDR shall be submitted in the Conceptual Design Review Package (CDRL 330).

The CDR shall cover the following:

1) Provide a functional block diagram of the system and equipment
2) Provide all CDR items indicated in Appendix
3) Provide narrative descriptions of the major subsystems proposed by the Contractor
4) Provide preliminary equipment layouts
5) Identify all interfaces between the major subsystems, provide a schedule, and identify responsibilities for completion of detailed definition of the interfaces
6) Confirm that the Contractor is familiar with the intended operations and maintenance environment
7) Provide physical dimensions of each equipment type
8) Identify power and other facility requirements for each equipment type
9) Identify information needs and decisions required from the Authority

3.2.4 Preliminary Design Review (PDR)

The objective of the PDR is to review the progress of the project and evaluate specification compliance as the entry/exit stations are developed. All Submittals required prior to the PDR shall be submitted in the Preliminary Design Review Package (CDRL 331). The PDR shall cover the following:

1) Schedule compliance review and discussion of variances or delays
2) Provide all PDR items indicated in Appendix G
3) Revisions of drawings and documentation submitted for the CDR
4) Complete customer and operator interface drawings, flow charts, detailed screen flows with actual screen shots, server graphics, messages and menus, including accommodations of all operating boundary and error conditions
5) Detailed technical descriptions of the PRCS major components
6) Detailed mounting arrangements and installation methods
7) Single-line power diagrams and functional block diagrams for the PRCS and DCU
8) Detail specifications for all data communications interfaces

9) Complete data dictionary and all file formats for all data tables
10) List of special tools
11) Description of operational and physical compatibility with the existing equipment and equipment installations
12) Design of access control for the following:
    a) Revenue handling system
    b) Software menus
13) Software system-level flow charts
14) Software data backup and recovery procedures
15) Software design descriptions (top level of software documentation) for all programmable equipment and systems

3.2.5 Final Design Review (FDR)

The FDR shall be conducted when the detailed design is complete and production drawings are ready for release. All Submittals required prior to the FDR shall be submitted in the Final Design Review Package (CDRL 332).

The FDR shall cover the following:

1) Schedule compliance review and discussion of variances or delays
2) Provide all FDR Items indicated in Appendix G
3) Shut-down and start-up sequences
4) Assembly drawings down to the lowest replacement unit level
5) Electrical schematic drawings, down to the individual signal or wire level, for each electrical circuit as required for the Authority to maintain equipment
6) Software documentation at the second level, consisting of structured data flow diagrams to the lowest level of decomposition with software module descriptions (or elemental process descriptions) in structured narrative format. The second level of software documentation is one level above source code and shall include descriptions for each equipment type
7) Input data definitions
8) Output data definitions
9) Diagnostic routines for system level and subsystem level self-test
10) Data dictionary
11) Final Engineering Drawings

3.2.6 Drawing Requirements

Contractor shall submit detailed, configuration controlled, Engineering Drawings for all equipment supplied under this Contract. Drawings shall be dimensioned in U.S. units (feet and inches) or both U.S. and metric units. Electrical schematic drawings shall be drawn in accordance with the standards of the Institute of Electrical and Electronics Engineers.

The review of drawings shall be construed neither as permitting any departure from the Contract nor as relieving Contractor of the responsibility for any error, including details, dimensions, and materials. Contractor shall submit drawings for review by the Authority.

3.3 TESTING

This section describes the requirements for the submittal of Detailed Inspection and Testing plans (CDRL 311), procedures and for the facilities at which tests shall be conducted.

The plan, schedule and format for all system installation and acceptance testing shall be submitted to the Authority and shall be approved prior to start of Installation Tests. A checklist of testing of each lane of equipment for all functions will be provided.

Provide all test and diagnostic equipment including special tools, electronic equipment, meters, laptop computer with appropriate software and communication ports, RF field and signal strength meters, transceivers, etc. necessary to conduct all tests, measure and record results, isolate, diagnose and de-bug deficiencies, and to generate reports and documentation of test results.

Provide sufficient number of PRCS tickets, properly encoded or prepared to test all specified features, devices, currency of all denominations, credit cards and other stock materials and consumables required for all test sequences.

The Authority and the parking operator may witness tests. The Contractor shall notify the Authority in writing at least seven (7) days prior to each test session. In event that the first test is not successful, the Contractor shall correct noted deficiencies and notify the Authority, at least two (2) days in advance, that the test session is ready to resume.

Inspections and tests observed by the Authority and parking operator shall not relieve the Contractor of responsibility for providing hardware, software and documentation in accordance with this Specification.

3.3.1 Inspection and Testing Program

3.3.1.1 Factory Acceptance Test (FAT)

The FAT test shall demonstrate satisfactory operation and performance of all components (a representative sample of overall quantity) of equipment interconnected to simulate the configuration of components, systems and subsystems as required herein

using the Authority's rates and discounts. FAT shall be performed at manufacturer's facility prior to delivery of components to site, using components specifically manufactured to meet the requirements of these specifications. Testing shall be observed by representatives of the Authority. Any and all third party devices or subsystems required for a fully functional simulation shall be provided and installed by Contractor for this test.

1) Components shall be interconnected and shall provide on-line data communication with software produced for this project. At least one fully operational simulated entrance lane, exit lane, fee terminal installation shall be included in the FAT. The software shall be fully integrated with all components and shall properly acquire, compile and provide all required reports of transactions, system activity and alarms, and shall demonstrate all required data security and password authorization features.
2) Network shall be configured as on-site, to allow for proper ports and protocol setup.
3) FAT shall exercise all functional and performance features of devices, subsystems and systems as required by these specifications.
4) FAT shall include production of all required system reports using data generated from transactions, activities, violations and alarms produced during the FAT as specified in these specifications.
5) Contractor shall correct deficiencies in components, subsystem or system design, manufacture or installation as required, and re-test in accordance with this section until satisfactory results are achieved.
6) Approval of results of FAT by the Authority shall in no way relieve Contractor from providing PRCS in full compliance with the requirements of these specifications. Approval of FAT shall not limit the Authority's right to later require changes to components, subsystems and systems, including PRCS reports to satisfy requirements of these specifications.

At the end of FAT the Contractor shall provide the Authority with a Factory Acceptance Testing Report (CDRL 307).

3.3.1.2 Installation Test

The installation test, defined in the Installation and Interface Plan (CDRL 303), shall fully test the equipment and systems installed at each installation location prior to full operation of system. The purpose of the installation test is to demonstrate that installed components systems and features are fully functional as specified.

1) Upon completion of the installation of the PRCS equipment at each lane or each piece of equipment, an installation test shall be performed.
2) Test installed equipment and systems at each location (entrance, exit, or office location) to confirm that the components installed at any location are fully operational as specified.
3) Test shall exercise all features and functional performance requirements of

equipment in accordance with specific test procedures document prepared by Contractor as required in this design specification.

4) Test shall include all individual lane equipment, communications networks, subsystem controllers, computer, workstations and reports.
5) Tests shall replicate FAT test results on installed equipment and systems.

3.3.1.3 Operational Test

Upon completion of all installation tests, demonstrations and training required herein, the Authority shall operate complete system for test period of not less than thirty days. When installation is phased, completion of all installation tests, demonstrations and training of each phase shall be designated at beginning of operational test period.

Contractor shall have a qualified and experienced technician on site (eight hours per day or as required) during 30-day test. When not on site, technician shall be on call with a one-hour response time to call from the Authority. During this period, the following performance standard shall be met in order for final acceptance to be issued:

1) All PRCS components shall be fully operational as an integrated system without downtime. For each downtime period of four hours or more, one working day will be added to acceptance cycle.
2) All electronic components shall be operational without downtime or programming problems for complete monthly reporting cycle. For each downtime period of more than one hour but less than eight hours or programming problem that delays report cycle, two working days will be added to acceptance cycle.
3) All test reports shall correlate 100% with cash receipts in each fee computer and APM for test period.
4) Testing will include cycle testing (1,000 – 10,000 iterations).
5) Maintain detailed records and logbooks of all system tests, events issues, repairs and maintenance. Provide the Authority with copies of all records.

3.3.1.4 Acceptance Testing

Contractor shall provide on-site personnel to operate system 24 hours per day, including weekends and holidays during acceptance testing.

Start test after successful completion of performance verification testing, when training as specified has been completed, when correction of deficiencies has been completed and when receipt of written start notification from the Project Manager.

Monitor all systems during acceptance testing. Coordinate monitoring with the Project Manager.

Record data on approved database driven forms so as to provide a continuous log of systems performance that include the following:

1) Date and time for all entries.
2) Name of individual making entry.
3) Environmental conditions.
4) Authority activities in process.
5) Description of all alarm annunciations, responses, corrective actions, and causes of alarms. Classify as to type of alarm.
6) Description of all equipment failures, including software errors.
7) Description of all maintenance and adjustment operations performed on system.
8) Daily and weekly tabulations.
9) Daily entries of performance data shall be reviewed by the Project Manager's representative designated to observe monitoring of system.

The Authority may terminate testing at any time when the system fails to perform as specified. Upon termination of testing the successful proposer shall commence an assessment period.

3.3.1.5 Testing Phases

The Contractor shall provide the Authority with an Overall Inspection and Test Plan (CDRL 310) thirty (30) days prior to the first test and a Detailed Test Procedure (CDRL 312) thirty (30) days prior to performance of each test. Within ten (10) days after completion of each test the Contractor shall provide the Authority with a Test Report (CDRL 313).

Phase I - Initial Testing

1) Time: 24 hours per day for 60 consecutive calendar days.
2) Make no repairs during this phase unless authorized in writing by the Authority's Project Manager.
3) If system experiences no failures, proceed to Phase III - Final Testing.

Phase II - Initial Assessment:

1) After conclusion of Phase I or termination of cycle testing, identify all failures, PRCS/AVI determine causes, and repair. Submit report explaining: Nature of each failure, corrective action taken, results of tests performed to verify corrective action as being successful, and recommended point for resumption of testing.
2) After submission of report, schedule review meeting at job site. Schedule date and time with the Project Manager.

3) At review meeting, demonstrate that all failures have been corrected by performing verification tests.
4) Based on report and review meeting, the Project Manager will direct Successful Proposer to repeat Phase I, restart Phase I, or proceed to Phase III - Final Testing.

Phase III - Final Testing:

1) Time: 24 hours per day for 60 consecutive calendar days.
2) Make no repairs during this phase unless authorized in writing by the Project Manager.

Phase IV - Final Assessment:

1) After conclusion of Phase III or termination of testing, identify all failures, determine causes, and repair. Submit explaining the nature of each failure, corrective action taken, results of tests performed, and recommended point for resumption of testing.
2) After submission of report schedule review meeting at job site. Schedule date and time with the Project Manager.
3) At review meeting, demonstrate that all failures have been corrected by performing verification tests.
4) Based on report and review meeting, the Project Manager will approve acceptance test or direct successful proposer to repeat all or part of Phases III and IV.

3.4 TRAINING

A final training course schedule and curriculum shall be prepared by the Contractor for each training course (Cashier, Supervisor, Technicians, Software staff, Auditing and Accounting) to be conducted for Authority personnel, and submitted for approval to the Authority. The training shall provide the Authority personnel with information and skills needed to instruct the Authority line personnel to operate, maintain, and support the PRCS equipment to the lowest replaceable component level. The detailed training program curriculum shall ensure the Authority is fully qualified to operate and maintain the LPR subsystem. Software training classes should accommodate no more than eight (8) staff members at one time.

The Contractor shall develop course material, provide course instructors, supply necessary handouts and manuals, prepare classroom aids, supply operational equipment for training purposes, and all other items as required to train the Authority personnel in the operation of the PRCS. The Contractor will provide sufficient training equipment to allow for no more than two (2) Authority-approved personnel per cashier station. The Contractor shall provide all Training Materials (CDRL 314) to the Authority sixty (60)

days before the scheduled start of classes. The Contractor shall put together a Training Schedule (CDRL 316) in conjunction with the Authority.

Training materials shall reference and/or incorporate the content of the Operations and Maintenance Manuals (Section 3.7) where appropriate. All the Authority training classes will be scheduled by the Authority personnel and shall not take place more than four weeks prior to revenue ready approval. The Authority reserves the right to videotape training sessions conducted by Contractor for review and future use.

All training programs, courses, and manuals shall be customized for the Authority. The customization effort shall include the Authority specific rules and procedures as they relate to the operation and maintenance of the PRCS equipment. In addition to formal training courses, Contractor shall provide field training visits during the initial revenue service period.

At a minimum, the training schedule must provide separate curriculum for five classifications of personnel. Each curriculum must be tailored specifically for the group to be instructed. The Contractor shall be required to provide all training aids, e.g. notebooks, manuals.

Training shall be conducted by personnel experienced in the version and applications installed at Ronald Reagan National Airport, possess clear communication skills, and supported by training aids. The Authority reserves the right to have Contractor replace trainer upon request. An adequate number and amount of training material shall be provided by the Contractor. All training material shall be provided to the Authority. The following is considered a minimum:

1) Functional flow charts, overall block diagrams, and descriptive material for all software
2) Schematic Drawings for each of the hardware components
3) Procedure manuals, specification manuals, operating manuals, technical and service manuals
4) Record Document drawings

Participants shall receive individual copies of technical manuals and pertinent documentation at the time the course is conducted. The courses shall be scheduled such that Authority personnel can participate in all courses (no overlap).

3.4.1 Training Guidelines

The Contractor's training courses shall comply with the requirements described in this section and shall include the following at a minimum:

3.4.1.1 Training the Trainer

"Train the Trainer" instruction forms the basis for delivery training to the Authority line personnel. Train the Trainer courses shall be provided for each Overview, Operations, Maintenance, Revenue Collections, and Network Operations course. The courses shall

be designed to train instructor and supervisory personnel at the Authority to deliver any of the indicated training courses subsequent to Contractors involvement. At the completion of training, the Authority trainers will demonstrate competency in the operation of PRCS by successful achievement on performance and written examinations.

3.4.1.2 Training Program Plan

Detailed outlines, lesson plans, and tests shall be submitted for review and approval by the Authority. Instruction shall be designed to include courses described below and shall cover equipment familiarization, systems operations, and field and shop maintenance. At a minimum the Contractor must provide a training program that is comprehensive enough to bring employees designated by the Authority to the level of proficiency required for operations, service, and maintenance of the furnished equipment. Formal training shall include both classroom and practical work, and shall be augmented by informal follow-up if requested.

Training mock-ups shall be provided to assist with the training. The operational equipment shall be retained by the Authority for in-house training. Practical training on equipment shall occupy a significant portion of all training classes.

The Training Program Plan (CDRL 315) is to be submitted to the Authority for approval no later than 60 days after Notice to Proceed.

Table 3-1: List of Training Courses and Participants

Participant	Number	Session 1	Session 2	On-site
Cashiers	TBD	✓	✓	
Supervisors	TBD	✓	✓	
Technicians	TBD	✓		✓
System Administrators	TBD	✓		
Office Staff	TBD	✓		

3.4.1.3 Participants

The approximate number of staff to be trained in each group, and the number of classes for each group are as follows:

1) Cashiers: The number of cashiers selected by the Authority shall be trained in the general operation of PRCS equipment, with each cashier participating in two sessions. The first series of classes shall be conducted in the four weeks immediately before installation and activation of the new PRCS equipment and shall consist of general system introduction and basic knowledge necessary to operate the system. The second session will be held shortly after each Cashier has had experience with the new PRCS equipment in an operational mode.
    a) The length of each training class shall be defined in the Contractor's

curriculum as approved by the Authority. Each block of training shall be provided at approximately five different time periods including all shifts (day, swing, and graveyard) with the same block of training in each to ensure all staff can participate without undue loss of staffing for normal operations.

b) Supervisors: The Authority will decide the number of supervisory personnel who shall be trained in the operation of all components of the PRCS, with each Supervisor participating in two (2) sessions. The first series of classes shall be conducted in the four (4) weeks immediately before installation and activation of the new PRCS equipment and shall consist of a detailed system introduction and detailed knowledge necessary to operate the system. The second session will be held shortly after each Supervisor has had experience with the new PRCS equipment in an operational mode.

2) Technicians: The number of Technicians selected by the Authority shall be trained in the operation of all components of the PRCS. Training of the Authority technicians shall include classroom instruction as well as on-site instruction. Informal training of the electronic technicians shall commence with the delivery, installation, and testing of the lane equipment. Formal training of the electronic technicians shall commence in the four weeks immediately before activation of the new PRCS equipment.
    a) Classroom instruction shall include instruction on preventative and corrective maintenance, system component diagnostics and repair procedures, and system component adjustment procedures for every item of equipment furnished as part of the PRCS. The preventative maintenance program written by the Contractor.
    b) The quality of instruction shall be such that the trainees will be able to maintain the system on a component replacement basis and to the Contractor's satisfaction in regard to the warranty requirements.
3) Software Technicians and Software/System Administrators: The number of Software Technicians and Software/System Administrators selected by the Authority shall be trained in system administration and software. Formal training of the software personnel shall commence in the four weeks immediately before activation of the new PRCS equipment.
    a) Training shall provide detailed instruction covering all systems, software and applications and support programs for the Authority. These courses shall include a functional overview of the complete software system and "hands-on" code modification. The course material shall be presented in depth with the instructor covering detailed design and structure.
4) Office and Accounting Staff: The number of Office and Accounting Staff selected by the Authority shall be trained in system operations, administration, and software features. Training of the office staff/accounting personnel shall commence in the four weeks immediately before activation of the new PRCS equipment

At the completion of training courses, all trainees that complete the course shall receive a certificate of successful completion.

3.4.1.4 Training Video

The Authority is interested in utilizing interactive training of the PRCS for new employees. The Contractor shall provide a firm fixed price for the development and delivery of a DVD video recording of necessary beginning level training for all participants on the PRCS.

3.5 WARRANTY

The Contractor shall develop a Warranty Plan (CDRL 317) outlining the processes and procedures to be implemented in order to meet the requirements set forth herein. A draft of the Warranty Plan shall be submitted at the FDR and a revised final version shall be provided a minimum of ninety (90) days prior to the start of any warranty period.

3.5.1 Warranty Coverage

The Contractor hereby warrants to the Authority that all of the equipment, computer systems and software, including firmware as warranted by third party suppliers, furnished under this Contract shall be free from defects in material and workmanship under normal operating use and service.

3.5.2 Warranty Period

The Contractor shall provide their standard or a one (1) year warranty, whichever is longer, which shall commence after completion of acceptance testing.

At the end of the warranty period, the Contractor shall provide the Authority with a list of all spare parts and consumable items used or that are planned to be used to support the entry/exit stations for the following year.

3.5.3 Remedial Work

The remedial work to correct any and all deficiencies shall include the repair or replacement, at the Contractor's option, of equipment, components, devices and/or materials including all applicable software and/or firmware as warranted by third party suppliers. All remedial work shall be authorized by the Authority prior to implementation.

3.5.4 Warranty Conditions

The Authority will operate and maintain the equipment and software in accordance with the Contractor's specific instructions in order to maintain this warranty. The Authority shall be held harmless for operating the equipment and computer systems improperly if the Contractor has not provided adequate or correct training, and/or complete operating manuals, maintenance manuals, electrical and electronic schematics, mechanical diagrams and complete computer program documentation which includes full source codes as specified in Section 2.3.3.

No warranty period shall end unless finished documentation is provided by the Contractor and approved by the Authority as specified in Section 2.3.3.

3.5.5 Negligence

The warranty shall not apply to any equipment which has been damaged through accident or negligence, or which has been subject to anything other than normal use. Temperature, humidity and ambient electrical conditions described in these Design Specifications or presented in Contractors proposal shall be considered normal operating conditions for this system.

3.5.6 Consumable Items

The warranty shall not cover the replacement of normal consumable items or items which are replaced in usual and scheduled preventative maintenance programs, such as light bulbs and normal wear-related items as identified in the Consumable Items List (CDRL 319).

3.5.7 Fleet Defects

If during the said warranty period the rate of failure of any part or component, from any one cause or from various causes, exceeds fifty (50) percent of the mean quantity of such item delivered to the Authority, then the entire quantity of such item shall be considered to have failed, and shall be repaired, corrected, or replaced as hereinafter provided. After correcting the defect, the Contractor shall undertake and complete a work program reasonably designed to prevent the occurrence of the same defect in all other equipment purchased under this Contract. The work program shall include inspection and correction of the defective or potentially defective parts in all of the equipment. The work program needs to be approved by the Authority prior to implementation.

3.5.8 Warranty Personnel

The Contractor shall provide all support equipment necessary to perform the warranty work. When there is warranty work to be performed, the Contractor's warranty personnel shall be required to work a minimum of eight (8) hours per day, five (5) days per week on the warranty and repair of the equipment provided under this Contract or until completion of the work.

In addition, a person with the capabilities to make programming changes shall be available either on-site or via remote help desk to support the Contractor's warranty personnel.

Liquidated damages will be in effect at all times.

3.5.9 Warranty Repair Agreement

The Contractor shall be responsible for all costs associated with the repair of components and/or subsystems, and the shipping charges to and from the Contractor's repair facilities, and the costs associated with their re-installation under the Warranty Repair Agreement (CDRL 320). The Contractor shall be responsible for meeting with the Authority to determine the schedule of repairs. Contractor may perform, at their option the required repairs at the Authority facilities, with any necessary personnel, tools and materials at the Contractor's own expense.

3.5.9.1 Repair Time and Liquidated Damages

Warranty repair shall be performed in a maximum of seven (7) calendar days. Repairs deemed critical to be the PRCS operation shall be performed within twenty-four (24) hours. Critical components will be defined by the Authority and the Contractor during the award process. The Contractor shall make available sufficient resources and replacement parts to assure one hundred percent (100%) support of the Authority entry and exit stations availability during warranty repair.

Upon failure to provide adequate resources to support one hundred (100%) percent PRCS and data collection availability as a result of defects in materials, workmanship, or function under the terms of the warranty, the Contractor shall be required to pay liquidated damages as required in the Terms and Conditions.

3.5.9.2 Compensation for Unresponsiveness

In the event the Contractor fails to comply promptly with their obligations under these specifications or with a request by the Authority to repair, replace or correct the failed components, subsystems, equipment and/or materials, the Authority shall upon written notice to the Contractor, have the right to deduct the cost of labor and materials from any compensation due or become due to the Contractor. In the event the Contractor has been paid, the Contractor agrees to compensate the Authority for the costs thereof.

3.5.9.3 Access to Equipment in Revenue Service

The Contractor shall follow the proper Authority procedures for gaining access to the PRCS equipment in the field. The Contractor shall not modify or repair any equipment in revenue service without the approval of the Authority's PM or an Authority authorized representative.

3.5.9.4 Repair Reporting

During the entire warranty period, any and all repairs and/or adjustments of equipment by the Contractor shall be documented by the Contractor. A database driven repair form shall be submitted at the end of each week. Each repair form shall provide time, day, type of equipment, equipment number, type of failure, type of repair or adjustment, and performed by whom. Repair Reports (CDRL 321) shall be submitted electronically using MS Excel or other approved software. In addition to the Repair Report, the Contractor

shall provide the Authority with an Out-of-service Report, indicating how long a lane was out of order.

3.6 QUALITY ASSURANCE (QA) and QUALITY CONTROL (QC)

QA and QC measures will be taken by both the Contractor and the Authority to ensure the quality of all activities associated with this procurement.

3.6.1 Contractor's QA Program Plan

The Contractor shall submit to the Authority within sixty (60) days of the NTP a comprehensive QA Program Plan (CDRL 322) designed to ensure the quality of all activities, including design, purchasing, inspection, handling, assembly, fabrication, testing, storage, shipping, and warranty/repair work. The Contractor's QA Program Plan shall be ISO 9001 or equivalent compliant.

The plan shall describe all quality control procedures of the Contractor and any sub-suppliers. The plan must include or meet all of the requirements specified in the Authority's QA Program Plan. The Contractor may submit an existing QA Program Plan for Authority approval.

The Contractor shall conduct regular inspections in accordance with guidelines defined by the QA Program Plan.

The Authority will, at its own discretion, perform QA monitoring of work done under this Contract, including monitoring of the Contractor's or Subcontractor's QA activities. Upon request, the Contractor's QA records shall be made available to the Authority for inspection. Such QA activities performed by the Authority shall not reduce nor alter the Contractor's QA responsibilities or its obligation to meet the requirements of this document.

At any time during the manufacturing process, subject to a minimum of five (5) days prior notice, the Authority may choose to schedule a visit to the Contractor's facility or a Subcontractor's facility during normal working hours to audit the manufacturing and quality control processes.

3.7 INSTALLATION

1) All installations shall be completed by workers who are experienced in installing computer hardware, software, and computerized parking control equipment components.
2) Installation of the PRCS shall be performed by technicians trained for their specific tasks with no less than two (2) years hands-on experience. The Contractor shall provide to the Authority the appropriate documentation demonstrating that the installation is being performed by certified electronic technicians.
3) The Authority will have multiple construction projects in progress that will

provide facilities or infrastructure relevant to the PRCS project. The Authority will detail and give the status of these other projects at a Project Pre-proposal Meeting. The Contractor and the Authority work together to schedule work that expedites the PRCS project in conjunction with the other projects at the Airport.

3.7.1 Installation Phasing

1) The Contractor shall verify that the installation sites are in readiness for equipment installation. Any discrepancies between actual conditions and design conditions shall be brought to the attention of the Authority and the Consultant. Installation shall not proceed until all significant discrepancies have been resolved.
2) The Authority and the Consultant shall conduct a meeting with the Contractor prior to beginning installation to discuss the installation program and identify key events. This meeting shall be scheduled as soon as the contract has been awarded. The Contractor's installation program shall be supported by a Gantt Chart that depicts essential events across a time scale. The Authority, Consultant, and Contractor shall reach tentative agreements on:

    a) The occasions that the Consultant shall observe the tests of equipment components and the complete equipment system, and
    b) The schedule for installation work so as to ensure the availability of a maximum number of operable lanes to meet peak period activity.

3) The Contractor shall install all equipment described in strict accordance with the manufacturer's recommendations, the specifications, and applicable local codes. Installation shall include all necessary site preparation including island modifications necessary to support equipment installations, and all other work necessary to complete the installation. Should any need to depart from the specifications be revealed as the work progresses, the Authority and Consultant shall be informed. The Authority's approval and Consultant's approval of departures shall be required.

    a) The Contractor shall provide periodic visual inspection of construction and installation

Verification of construction site clean-up shall be provided. The Authority and Consultant shall be notified of the Contractor inspections and may elect to participate. Notification shall be a minimum of forty-eight (48) hours before the inspection.

3.7.2 Office Layouts

1) Computer Room – Garage A
    a) The PRCS' CDMS shall be installed in computer room of the parking operations office of Garage A (this is the location where the file server for the current PRCS resides.) The Authority shall have final approval of equipment placement within Garage A

2) Parking Offices
    a) The computer workstations and printer shall be placed in the Parking Office within Garage A
3) Cashier Station – The Contractor will provide layout dimensions for the cashier station equipment and surface layout

3.7.3 Removal of Existing Equipment

The Contractor shall be responsible for removal of all equipment replaced or abandoned (e.g. barrier gates) due to the implementation of the systems detailed in this specification. The Authority shall be responsible for moving and storing the equipment components that have been removed by the Contractor. The Contractor shall inform the Authority twenty-four (24) hours before the equipment is removed.

3.7.4 General Physical Requirements

3.7.4.1 General Equipment Mounting

All equipment shall be mounted in cabinets. For outdoor application, cabinets designed to protect equipment from rain, dust, and blowing snow shall be utilized. For indoor equipment, EIA 19" equipment cabinets shall be utilized. All cabinets shall include locking doors to prevent unauthorized tampering with electronics.

Any equipment weighing more than fifteen (15) pounds shall be mounted on locking drawer slides. Any equipment with top access (as opposed to front access) shall be mounted on lockable drawer slides. No equipment shall be installed in a cabinet where it interferes with access to other equipment nor closing and locking of cabinet doors.

Cables shall be neatly dressed in equipment cabinets so that they do not interfere with other equipment. Vertical cable runs shall be along the side of the cabinet. Interfaces between cabinets shall be at the top and/or bottom and not randomly interfaced across the vertical height of the cabinet. Power and ground cables shall run on the other side (vertical runs).

Cabinets shall be provided with vertically mounted panel strips on either side towards the rear of the cabinet. One strip shall be utilized for only the utility power supporting maintenance (e.g., to plug in trouble light and test equipment). The other power strip shall be utilized to provide AC power to electronic drawers mounted in the cabinet.

Cabinets shall include cooling fans that circulate conditioned air through the cabinet. Airflow shall be from the bottom to the top with hot air exhausted at the top. The Contractor shall provide adequate airflow to meet heat dissipation of electronics within the cabinet. Equipment shall be mounted in the cabinet in such a manner as to not impede airflow. Changeable air filters shall be utilized for air input to cabinets.

Equipment shall be mounted in the cabinet in a manner complying with human safety. All mounting screws shall be utilized. No equipment shall be suspended by cable

interconnects. No equipment shall be laid on top of other equipment in a cabinet inhibiting the removal of the bottom unit. Cabinet mounting adapters shall be utilized for equipment not inherently compatible with 19" cabinet mounting.

All cabinets with a similar compliment of electronic chassis shall be assembled and cabled in a like manner. Two cabinets shall have the same top-to-bottom sequence of electronics chassis and cable routing and interconnects in a common manner. Velcro-type cable ties shall be utilized to secure cables and strain reliefs shall be utilized to prevent cable fatigue at connectors. Cables shall have adequate slack to support electronic drawer pullout and disconnect.

Where conduit is terminated in cabinets, it shall be terminated in cabinets with a cap to protect cable sheaths from sharp edges. No unprotected (non-sheathed) cable shall be interconnected in cabinets. A common, copper grounding bar shall be provided in each cabinet and each grounding bar shall be interconnected between cabinets.

A lockable disconnect switch shall be provided, controlling the power strip, to provide a safety disconnect of power at the cabinet level. An indicator shall be included to support indicating power off/on status. Each cabinet shall also include a thermal sensor with alarm, settable to the lowest operating temperature (heat) of equipment mounted within the cabinet. A deadband shall be included with the thermal sensor 2° C to prevent alarm cycling at threshold. Both alarm temperature and deadband shall be adjustable.

EIA bonding and grounding standards shall apply for all metallic communications circuits. Surge and lightning protection shall also be provided by the Contractor related to metallic communications interfaces. Power grounding and distribution shall comply with NEC, IEEE Standards for Powering and Grounding Sensitive Electronic Equipment, and for providing emergency power to industrial equipment.

All PRCS equipment (e.g. cabinets, gates, etc) shall use Chicago Locks 17R3-2 or equivalent.

3.7.4.2 Markings

All cable shall be permanently marked on both terminating ends with a unique identification number that corresponds to Record Document drawings provided by the Contractor in accordance with EIA/TIA 606 standard. Markings shall be permanent and easily readable by a technician with normal eyesight. Marking shall not deteriorate with age, exposure to light, or by handling by maintenance personnel. The markings on the cable shall uniquely identify the cable's function and interconnections.

Each connector shall have a unique identification. The identification may be by cabinet and drawer as well as connector number providing a unique cable identification. Cable drawings shall refer to unique connector identification for interface. It shall be very clear to a technician which cabinet, electronic drawer and associated connector that a cable is connected.

All switches and indicators shall be identified as to function. Each terminal block shall have a unique identification and each terminal clearly numbered. Interconnect diagram shall reference terminal block number as well as terminal number for interconnects. All electronic chassis, drawers and functional modules shall have as a minimum, a permanently attached tag with "functional name, model number, manufacture's name and address and serial number."

All power interconnects shall include the power requirements and maximum current load. Equipment shall be selected with resettable circuit breakers rather than fuses. An indicator shall be utilized to show power status of equipment.

All high voltage (over 24 volts) and high current (over 1 amp) power terminal shall be protected from inadvertent contact by a technician. The cover shall include a warning against electrical shock. No equipment shall be supplied that does not meet NEC requirements for electromagnetic and radio frequency compatibility.

3.8 DOCUMENTATION

Block diagrams, exploded views, illustrated parts breakdowns, and schematic drawings shall be used to facilitate descriptions of assemblies and the relationships of components, subsystems, and systems and shall be included in the Documentation List (CDRL 329). All documentation detailed in this specification shall be included irrespective of equipment manufacturer. If approved by the Authority, photographs may be used to support specific descriptions.

A Manuals Schedule (CDRL 323) for development of the required manuals with time allotted for the Authority review shall be submitted 120 days after NTP. The training documentation shall be separate from the operation and maintenance manuals, but may reference those manuals.

One reproducible master and the noted quantities for each of the following approved manuals shall be furnished for the PRCS equipment:

1) Operation instruction manual 2 copies
2) Repair and maintenance manual 2 copies
3) Shop maintenance manual 2 copies
4) Illustrated parts catalog 2 copies
5) Diagnostic Test Equipment manuals 2 copies
6) Special tools manuals 2 copies
7) Maintenance manuals for microprocessor based products 2 copies
8) Integrated wiring diagrams 2 copies
9) Software user manuals 2 copies

10) OEM manuals for all subassemblies 2 copies

All manuals and schematics including flow charts and trouble-shooting procedures must be written in English. Manuals shall be written to be understood by persons with a high school education. All measurements must be presented in English units.

Manuals, catalogs, diagrams, views, illustrated parts catalogs, trouble-shooting flowcharts and schematic drawings shall be supplied on electronically in file formats compatible with software that is mutual agreed on. All production and assembly drawings shall be made available in hard copy and/or digital in electronic file format. Specifically the following shall be implemented for drawings:

1) Language on the drawings shall be in English and may include one other language.
2) Drawing formats will not be altered through the course of the project.
3) A set of 30 drawings each (selected by the Authority) related to the outer dimensions of the exit and entry barriers, including the main components will be prepared in both English and metric units. The remaining part of the drawings will be only in metric units.
4) Any drawings required for use by subcontractors other than the Contractor's subsidiaries (e.g., installation, maintenance, etc.) shall be provided in English units.

During the design process, the format of such documentation will be determined as agreed upon by the Contractor and the Authority.

Documentation provided in electronic file format shall be as follows:

1) Manuals and illustrated parts catalogues will be provided on CD's in Portable Document File (PDF) format and in a modifiable electronic format (Microsoft Word).
2) Diagrams, views and flow charts will be provided in DXF-format on CD's.
3) Electrical CAD files will be provided on USB flash drive, CD's and/or DVD's.
4) Schematic drawing will be provided in Authority approved format.
5) Mechanical CAD files will be provided on USB flash drive, CD's and/or DVD's.
6) CAD drawings will be provided in Authority approved format.

Magnetic media shall not be copy protected or encrypted in any way. Any revisions to submitted materials shall also result in the update of magnetic media.

3.8.1 Manual Submissions

Manuals shall be submitted for approval as a part of the FDR. One complete set of manuals shall be provided to the Authority prior to the start of the acceptance testing.

Information gathered during installation and acceptance testing and during the warranty period shall be incorporated into the manuals for the final submittal.

3.8.2 Revisions

Revisions to draft and approved manuals shall be recorded on a control list in the front of each manual. The list shall be issued with each revision and shall show the date of each revision and the page reference. Updated lists and revisions shall be maintained in the manuals by the Contractor until the warranty period expires. Revisions shall be prepared before the arrival of altered components and immediately after procedures are changed or errors are found.

Manuals shall be numbered, and revisions to the manuals shall be issued according to manual number. Updating of lists and manuals shall be performed on a not-less-than quarterly basis during the first twelve (12) months after the manuals are delivered and then on a not-less-than semi-annual basis for the duration of the warranty period.

Revisions related to alterations of subsystems or assemblies shall be issued before the arrival of components or retrofit packages.

3.8.3 Content Requirements

The content of the various manuals shall meet the subsequent requirements.

3.8.3.1 Operation Instruction Manual

The Operation Instruction Manual (CDRL 333) shall contain all information needed to obtain a top-level understanding of how to operate the PRCS equipment. This manual is intended for use by service, maintenance, and supervisory personnel. The following sections shall be provided:

1) General entry and exit stations or computer system familiarization material.
2) Location, function, and operation of pertinent controls, indicators, and switches.
3) Entry and exit barrier setup and shutdown procedures.
4) Trouble symptoms, diagnostic methods, and procedures for isolating minor faults.
5) Tasks assigned to each service technician, as appropriate for the type of service required.
6) Fingertip maintenance, including clearing jams and loading ticket stock.

3.8.3.2 Repair and Maintenance Manual

The Repair and Maintenance Manual (CDRL 334) shall provide all information needed for troubleshooting in-service failures and for performing periodic maintenance including when, where and how for each component; including general servicing, lubricating, and inspecting.

The manual shall expand on the information furnished in the Operation Instruction Manual and shall include basic schematic and block diagrams to provide fault diagnosis information appropriate for in-service maintenance, including a complete listing of error codes as provided by the individual sub-components.

3.8.3.3 Shop Maintenance Manual

The Shop Maintenance Manual (CDRL 335) shall provide all information needed for in-shop repair and trouble diagnosis of the Lowest Level Replaceable Unit (LLRU) and Lowest Level Replaceable Component (LLRC).

The manual shall contain detailed flow charts, exploded parts diagrams and schematic drawings, and detailed analyses related to each LLRU and LLRC so that the Authority maintenance personnel will be able to effectively service, inspect, maintain, adjust, and troubleshoot the LLRU and LLRC.

The LLRU and LLRC for this contract is defined as units such as PC boards, displays, keypads, wiring harnesses, and complete electromechanical assemblies as sold by the Contractor or suppliers as spare parts.

The Shop Maintenance Manual shall provide information needed for in-shop repair and trouble diagnosis of each LLRU to the level of the LLRC. Printers, bulk storage units, power supplies, and power connection boxes shall be considered line replaceable units, whether or not they contain lower level subassemblies (LLRUs) that can be easily replaced in the field. Printed circuit boards shall always be considered LLRUs.

Transistors, diodes, capacitors, resistors, relays, solenoids, motors, gears, springs, bearings, cams and the like shall be considered replaceable components unless they are on multi-layer or surface-mount printed circuit boards. The manual shall contain detailed flow charts, exploded parts diagrams and schematic drawings, and detailed analyses related to each LLRU so that the Authority maintenance personnel will be able to effectively service, inspect, maintain, adjust, troubleshoot, repair, replace, and overhaul the LLRU.

3.8.3.4 Illustrated Parts Catalog

The Contractor shall submit an Illustrated Parts Catalog for each subsystem assembly, LLRU, and LLRC. Each subsystem assembly, LLRU and LLRC shall be referenced by assigned part number and, where applicable original equipment manufacturers part number. Equivalent parts available from other manufacturers shall be identified, including the name address and phone numbers of the corresponding suppliers.

Catalogs shall include, where applicable, schematic drawings to facilitate descriptions of parts and assemblies, including cables and wire harnesses. The Contractor shall identify long-lead-time parts and assemblies, as those that cannot be easily obtained within thirty (30) days.

Catalogs shall include, where applicable, schematic drawings to facilitate descriptions of parts and assemblies. Printers, bulk storage units, power supplies, and power connection boxes shall be considered line replaceable units, whether or not they contain lower level subassemblies (LLRUs) that can be easily replaced in the field. Printed circuit boards shall always be considered LLRUs. Transistors, diodes, capacitors, resistors, relays, solenoids, motors, gears, springs, bearings, cams and the like shall be considered replaceable components unless they are on multi-layer or surface-mount printed circuit boards.

After warranty, it is the Authority's intent to have the capability of ordering and purchasing Contractor delivered equipment down to the level of componentry of, for example, printer heads and not just the ability to swap out the entire print module.

The Contractor shall provide a list of all equipment manufacturers and suppliers, including their part numbers relevant to this Contract's equipment design and build.

3.8.3.5 Diagnostic and Test Equipment (DTE) and Special Tools Manuals

The DTE and Special Tools Manuals (CDRL 336) shall provide operation, adjustment, maintenance, troubleshooting, and storage instructions. The manuals shall also contain DTE replacement parts information as well as a Special Tools List (CDRL 324).

The Authority shall have access to an on-site test lab to test rate changes prior to deployment to the production system.

3.8.3.6 Integrated Wiring Diagrams

Integrated Wiring Diagrams (CDRL 327) shall include the following drawings:

1) Pin-to-pin connector terminal designations and wire designations at both sides of each connection for connectors and terminal blocks
2) Subsystem-level wiring diagrams and schematics for each subsystem. The diagrams shall be compatible with the schematics

3.8.3.8 Software User Manual

The Contractor shall provide a Software User Manual (CDRL 328) containing detailed operating instructions and procedures to be used by maintenance, revenue service, and other Authority personnel. Information in the manual shall be presented in terms that are meaningful to users. The manual shall include a system operation description (hardware

and software) as it relates to the user's tasks. Sensitive information that is not to be distributed to all departments shall be contained in a separate document marked Confidential. The nature of this information will be mutually agreed upon between the Contractor and the Authority.

The user manual shall include a functional explanation and description of each application program and its use. This manual shall **not** be written as a programmers' document. Procedures shall be explained step-by-step with an explanation of how each step is performed, what parameters can be adjusted, and the effects obtained by varying each parameter. All user guidance and error messages shall be described, along with the steps necessary for recovery from error.

Operating instructions also shall describe procedures to be followed as a result of system restarts or failures. The manual shall have sufficient information to enable the user to restart or re-configure the system and take diagnostic data dumps.

4. SERVICES

4.1 TECHNICAL SUPPORT

On-site technical support shall be provided by the Contractor on an as-needed basis. Support personnel qualified to maintain the Contractor's PRCS equipment shall test and resolve operation and maintenance problems when qualified Authority personnel have been unable to resolve those problems during the applicable warranty period.

The Contractor personnel shall be thoroughly familiar with the operation of all PRCS equipment being procured. During the warranty period, the Contractor personnel shall isolate failures, provide replacement parts, and respond to any warranty claims, including initiation and follow-up of remedial actions.

The Contractor support personnel shall include field service engineers, technicians, and repair personnel as required and shall be on the Authority property until the PRCS equipment has completed the acceptance testing, and through the warranty period, within two (2) working days of the Authority’s request thereafter for problems not resolvable through a remote help desk.

4.2 MAINTENANCE

Maintenance shall be structured as follows:

1) **Level I:** Preventive cleaning and field adjustments.
2) **Level II:** Troubleshooting, field repair, removal and replacement of defective parts, returning the PRCS equipment to successful revenue service.
3) **Level III:** Shop repair, printed circuit board and component level repair, module adjustments.

The Contractor shall perform Level I and Level II maintenance for a minimum of six (6) months after revenue-ready status. During this six months of Level I and Level II

maintenance, the Contractor shall allow the Authority to shadow its maintenance personnel (e.g., attend maintenance operations) for ninety (90) days so that Authority staff can achieve on the job training following their formal training. Formal training as described in Section 3.4 must precede the ninety days of shadowing.

If the Contractor has not provided formal training in sufficient time to allow for the Authority staff to conduct the ninety days of shadowing activities, the Contractor's Level I and Level II maintenance period shall extend to allow for the full ninety days of shadowing activities, extending beyond the one year warranty period as necessary.

The Contractor shall perform Level III maintenance commencing at installation, through and including the warranty period. The Contractor shall also perform all types and levels of maintenance during training and installation time frames leading up to revenue-ready status of PRCS equipment when customers begin using the PRCS. The Contractor shall be responsible for responding to warranty claims, including installation and follow-up of remedial actions. The Authority plans to perform the Level III maintenance once the warranty period has ended.

The Contractor shall provide on-site personnel qualified to troubleshoot all aspects of the system from the time of first equipment installation through system acceptance.
The Contractor shall provide on-call technical support to assist the Authority in the maintenance and operation of the system. This on-call support shall be provided via telephone for hardware and software problems and operational troubleshooting in one-year increments after the one-year warranty period. The Authority shall have the option to renew telephone technical support annually.

The Authority shall retain the option for Level III maintenance in support of PRCS equipment to be provided by the Contractor for a one-year period after system acceptance (the Original Maintenance Term), with such adjustments for warranty work outstanding at the time of system acceptance as the parties may negotiate. The Authority shall have the option to renew annually after the initial Maintenance Term at a price to be negotiated as part of the contract award process.

The maintenance services to be provided by the Contractor shall include *preventive*, *routine*, and *emergency* maintenance service.

Preventive maintenance services shall be provided in accordance with the provisions of a Preventive Maintenance Manual (CDRL 401) that the Contractor issues for each component or subsystem of the PRCS. Preventive maintenance services shall include but are not limited to:

1) Inspection
2) Testing
3) Necessary adjustment
4) Lubrication
5) Parts cleaning

6) Software updates

All preventive maintenance will be scheduled in advance by the Contractor and a notification will be sent to the Authority no later than two (2) weeks prior to scheduled date. Random checks by the Authority will be carried out without prior notice to the Contractor.

Routine maintenance services shall include scheduled overhauls as recommended by the equipment and software manufacturer.

Emergency services shall include inspections and necessary tests to determine the causes of equipment or software malfunction or failure. The emergency services shall also include the furnishing and installation of components, parts, or software changes required to replace malfunctioning system elements.

The maximum time for corrective action to any failure other than an underground fiber break shall be four (4) hours (refer to Section 4.2.3 for a discussion of response times for corrective measures). Failure to complete corrective action in a timely manner shall result in the imposition of liquidated damages by the Authority. The Contractor shall be responsible for repair to the component level of replaceable, functional modules.

The Contractor shall provide adequate spare modules and repair turn-around to assure that spare modules are available on site to accommodate repair of a failure to a 99% confidence level. For 95% of the failures that occur, onsite spares shall be available.

4.2.1 Maintenance Provider

The Contractor shall identify in their proposal to the Authority the parties responsible for performing the PRCS warranty and maintenance work. Information shall include an identification of the provider, location of the provider, and number of personnel available to perform the PRCS warranty/maintenance work.

The Authority requires local accessibility of the successful Contractor. As a minimum, the Contractor will have readily accessible hardware technicians trained at the parking equipment Contractor's factory available during the warranty period and throughout the life of any extended maintenance agreement.

It is required that a software/systems technician completely knowledgeable in the operating system and application software packages be locally available during the warranty period, and preferably throughout the life of any extended maintenance agreement. Local availability implies the technicians and service personal can comply with the response times outlined in Section 4.2.3.

4.2.2 Preventive Maintenance Schedule

The Contractor shall submit to the Authority with the proposal a recommended schedule for preventive maintenance services and corresponding task sheets – a Maintenance

Master Plan (CDRL 402). Preventive maintenance services during peak activity periods shall be avoided. In advancing the recommended schedule, the Contractor shall coordinate with the Authority to establish the prevalence of peak lane-activity periods.

4.2.3 Response Time – Corrective/Repair Services during Warranty Period

The functional units utilized to build the system shall have a minimum Mean Time Between Failures (MTBF) of 43,800 operating hours. All necessary steps shall be made to achieve the least amount of time that a component is inoperable. To accomplish this goal, the Contractor shall instruct or delegate Authority-appointed maintenance technicians to diagnose any component failure/malfunction of the PRCS. Authority-appointed maintenance technicians shall make a timely preliminary inspection or investigation to verify the existence of any malfunction observed and/or reported by Authority personnel.

Downtime is critical and must be kept to a minimum. Services to remedy parking equipment component(s) malfunction shall be started following the Contractor's receipt of a malfunction notice from the Authority. Services to remedy the malfunction shall begin within two (2) hours of notifications. Repairs are to be made as expeditiously as possible – within four (4) hours of notification. Failure to complete corrective action in a timely manner shall result in the imposition of liquidated damages by the Authority.

Services to remedy non-parking equipment component(s) (e.g., workstations, printers), malfunction shall be started following the Contractor's receipt of a malfunction notice from the Authority. Repairs are to be made as expeditiously as possible – within one business day of notification.

The Contractor shall acknowledge notification of the problem, error, or fault within 30 minutes. For the warranty and extended maintenance agreements, factory trained technicians shall be locally-accessible during normal business hours.

4.2.4 Maintenance Log

The Contractor shall maintain an electronic Maintenance Log (eML) of all preventive maintenance and corrective/repair services performed during the warranty period. The Log shall be in an Authority-approved format that includes summaries. The Log shall be available for inspection by the Authority at any time during the warranty period. The Maintenance Log shall be turned over to the Authority at the end of the warranty period. The log shall include a parameter driven maintenance log (by date, by component type, by specific module, by problem type) and inventory reports.

The Log shall itemize the history of preventive maintenance and corrective/repair activities. The Log shall include:

1) A sequential number for each failure
2) Identification of the problem
3) Date/time failure reported

4) Reporting party
5) Assigned technician
6) Corrective action
7) Identification of replaced modules
8) Date/time malfunctioned module was tested and verified to be operational
9) Delivery to depot of failed module
10) Deliver to inventory of repaired module
11) Perpetual parts inventory module

The Log shall be kept on a component-by-component basis according to equipment number or component type. For the Maintenance Log, a component shall be defined as the major items within the PRCS, e.g. barrier gate, lane controller, workstation, etc. The Log shall also record all software and hardware updates.

The Contractor shall keep the eML current with all maintenance related issues.

4.2.5 Spare Components and Parts Replenishment

The Contractor shall provide a store of consumables and spare components. The consumables and spare components will be owned by the Authority and shall be maintained by the contractor. The Authority will provide a storage location of the consumables and spare components. Those consumables and spare parts shall be available to the Contractor for use during the equipment testing and warranty periods. The Contractor shall replenish the store as it is used, so that at the end of the test and warranty periods the store shall be equal to that provided at the onset of the Operational Demonstration Test. The contractor will supply spare parts for ten (10) years after completion of acceptance testing.

All equipment and parts shall be newly manufactured within the past six (6) months and never installed in an operational system other than for factory test purposes. When delivered to the Authority at the conclusion of the warranty period, an itemized list of manufacturers' part numbers, model numbers, pricing, supplier's address, supplier's telephone numbers, and any single-source components shall be identified.
The spare component store shall be turned over to the Authority at the end of the Contractor's warranty period.

Based upon the maintenance experience during the warranty period, the Contractor shall recommend any changes in spare components that may prove to be appropriate. Where installed modules do not comply with required MTBF, the Contractor shall adjust the spares upward to accommodate the higher failure rate, or replace the units with more reliable units at no cost to the Authority.

4.2.5.1 Consumables

The Contractor shall provide a list of recommended consumable spares to support the PRCS for one (1) year. This list shall include, for example, such items as bulbs, belts, fuses, and bearings. Consumables are items that have a limited life cycle due to constant use and are expected to be replaced on a frequent basis. This list shall include the recommended quantities, their price, part number, supply source and country of origin.

The Contractor shall provide a store of consumables. The consumables will be owned by the Authority and shall be maintained by the contractor.

The Contractor shall provide the Airport with ticket specifications for the new PRCS prior to the installation of equipment. The Authority will have adequate tickets and receipt paper available to the Contractor before the PRCS is open to public use. The tickets shall be readily available from multiple suppliers.

4.2.5.2 Spare Components

In addition to the specific items listed above, the Contractor shall provide additional spares based on the number of modules utilized in the system. The Contractor shall supply 10% spare modules (or a minimum of one) of each replaceable module unless otherwise specified above. The PRCS shall not be considered ready for system acceptance testing until all spare components are delivered. All spares shall be identified by functional unit and shall be correctly referenced in spare parts lists.

The spare component inventory shall be owned by the Authority at all times and managed by the Contractor throughout the construction, testing, acceptance, and warranty periods. A perpetual spare parts inventory shall be maintained electronically to facilitate ordering of replacement parts and inventory control.

4.2.6 Maintenance Agreement

The Contractor must commit to support the PRCS for ten (10) years after the warranty period. This support shall be the same preventive, routine, and emergency services as previously described. The Contractor shall provide the Authority a base year (first year) price for the maintenance agreement. For the remaining nine (9) years, each subsequent year's price shall be increased over the previous year by the Consumer Price Index (CPI). The CPI applied would be the then current CPI on the contract anniversarY. Use of Contractor-provided post- warranty maintenance will be at the sole discretion of the Authority.

The Contractor is requested to guarantee that annual maintenance prices shall be protected with continued availability of system components from the manufacturer for a ten (10) year period for the Authority.

On-site, dedicated, full-maintenance services shall be at a guaranteed maximum annual cost to the Authority. This includes maintenance service for all equipment and software,

and includes, but is not limited to, spare parts, materials, labor, software, testing equipment, tools, etc. necessary to fully support the PRCS. Full maintenance shall be available 24 hours a day, 7 days a week, and 365 days a year. The same response times as stated previously shall be maintained.

In addition, a support letter shall be provided from the manufacturer to provide these maintenance services shall the contractor withdraw from the parking business.

4.2.7 Software Upgrades

Copies of all software (and software updates/upgrades made during the 1-year warranty period) must be provided to the Authority at the conclusion of the warranty period. All software and all software updates/upgrades shall be supported during the warranty period.

The Contractor shall demonstrate to the Authority that the mentioned materials were placed in escrow during the warranty period and will be maintained for at least ten (10) years. All software updates shall be provided free of charge during the manufacturer's warranty period; however, the Authority shall have the option of implementing the updates or not. All software updates must be accompanied by accurate and complete documentation.

When software upgrades include new functions and processes (enhancements), the Contractor shall provide a written evaluation of the upgraded software's impact on the Authority's PRCS prior to installation of the upgraded software. Central server and workstations shall be delivered with the most recent service packs and software patches unless specified by the Authority and must be updated throughout the warranty period unless specified by the Authority.

The Contractor shall provide normal software improvement releases (updates) when they become available or when delivered to other clients (whichever comes first.) Where software problems are identified by the Authority and are agreed to be minor, these problems shall be corrected in a new software release to be available to the Authority within four (4) months of notification.

4.2.8 Maintenance Support System

The Contractor shall select equipment that supports Simple Network Management Protocol (SNMP) and remote monitoring of distributed units. The network management shall be independent of the operational/applications software and integrated with a network management workstation.

The Network Management Terminal (NMT) with software shall display in a Graphical User Interface (GUI) equipment performance and operational status. A failed unit shall be displayed in icon- and color-coded form. Logs shall be available for management use, summarizing failure statistics down to the functional module level.

The Contractor shall provide on-site personnel qualified to troubleshoot all aspects of the system from the time of first equipment installation through system acceptance.

The Contractor shall provide on-call technical support to assist the Authority in the maintenance and operation of the system. In addition, from the thirty (30) days prior to the first day of planned operation through the first three (3) months of operation after Installation Inspection and Testing (I^2T) has been completed, the Contractor shall provide full-time on-site personnel to support the Authority with preventive and Level I maintenance and immediately to correct equipment problems when they arise.

4.3 PRCS MAINTENANCE REPORTING

The Contractor shall provide hardware capable of supporting the latest windows operating systems and suitable for tracking the maintenance performed on the PRCS equipment to be used at the discretion of the Authority.

The information gathered shall be used to track repair histories of all major components and sub-assemblies for quality control and maintenance costs. The application shall include Contractor supplied standard reports and shall have the functional capability to generate ad-hoc reports utilizing data maintained in the application database.

The application shall have a report generator with the functional capability to generate ad-hoc type reports utilizing the data elements maintained in the database, and to define report output format and presentation. The user shall be able to choose any specific fields in the database and set up filters, for example, all maintenance performed on a specific PRCS component during the period from one date to another date.

4.3.1 Maintenance Reporting Function

Information contained in the maintenance database shall be exportable to other computers within the Authority by an existing local area network.

The Authority repair personnel shall have the ability to enter completed maintenance reports into this system. The PRCS maintenance reporting application shall be capable of accepting the following information at a minimum:

1) Unique maintenance record number
2) Start time/ date of maintenance
3) End time/date of maintenance
4) Serial number of modules and sub-assemblies
5) Detailed information on action taken
6) Comments
7) Parts used
8) Codes for maintenance action and cause of action on various sub-assemblies and modules. The maintenance/cause of action may be coded into such

categories as abuse, failure, malfunction, routine maintenance, no trouble found. The Authority shall have the ability to add sub-assemblies/modules as determined by operating experience.

The PRCS maintenance reporting application shall have the capability to add additional fields to the database

4.3.2 Maintenance Plan

The Contractor shall identify the approach to properly maintain the PRCS and associated components. This Maintenance Plan shall indicate separately the projected resources, by craft, to perform contractor recommended preventative maintenance and projected service maintenance for all equipment and systems provided under this Contract.

The Maintenance Plan shall provide sufficient detail to permit the Authority to allocate manpower resources to the maintenance and service of the PRCS, and shall be scaled as necessary to reflect varied requirements over the anticipated service life of the system. The Maintenance Plan shall provide reference to the appropriate preventive maintenance requirement and service reliability performance standard.

5. Appendix

5.1. Appendix A: Milestone Payments

The Authority will make payments as the work proceeds based on the following payment provisions. The milestones listed are not intended to be in sequential order. The basis for the determination of the amount due the Contractor is detailed below for each Contract item.

MILESTONE	Complete
Acceptance of Project Management Plan and Contract Schedule	2%
Conceptual Design Review	3%
Preliminary Design Review	5%
Final Design Review	5%
First Article Testing	10%
Final Acceptance of Operational Testing	40%
Manuals and Other Documentation	10%
Operator Training	10%
Final Documentation (As-builts)	15%
TOTAL	**100%**

Notes:

(1) The percentages indicated in the above table indicate the amount of payment the Contractor is entitled to upon completion and approval by the Authority of the corresponding milestone. Partial payment may be made at the discretion of the Authority.

(2) The percentages apply to the sum of hardware services prices and selected options.

Additional Payment Provisions

(1) The items within Service Prices, Item 5, "Warranty" will be paid monthly and pro-rated over the period the warranty is in effect.

(2) Payment for item 6 of Service Prices, "Training" will be made upon successful delivery of all courses.

5.2. Appendix B: Site Survey

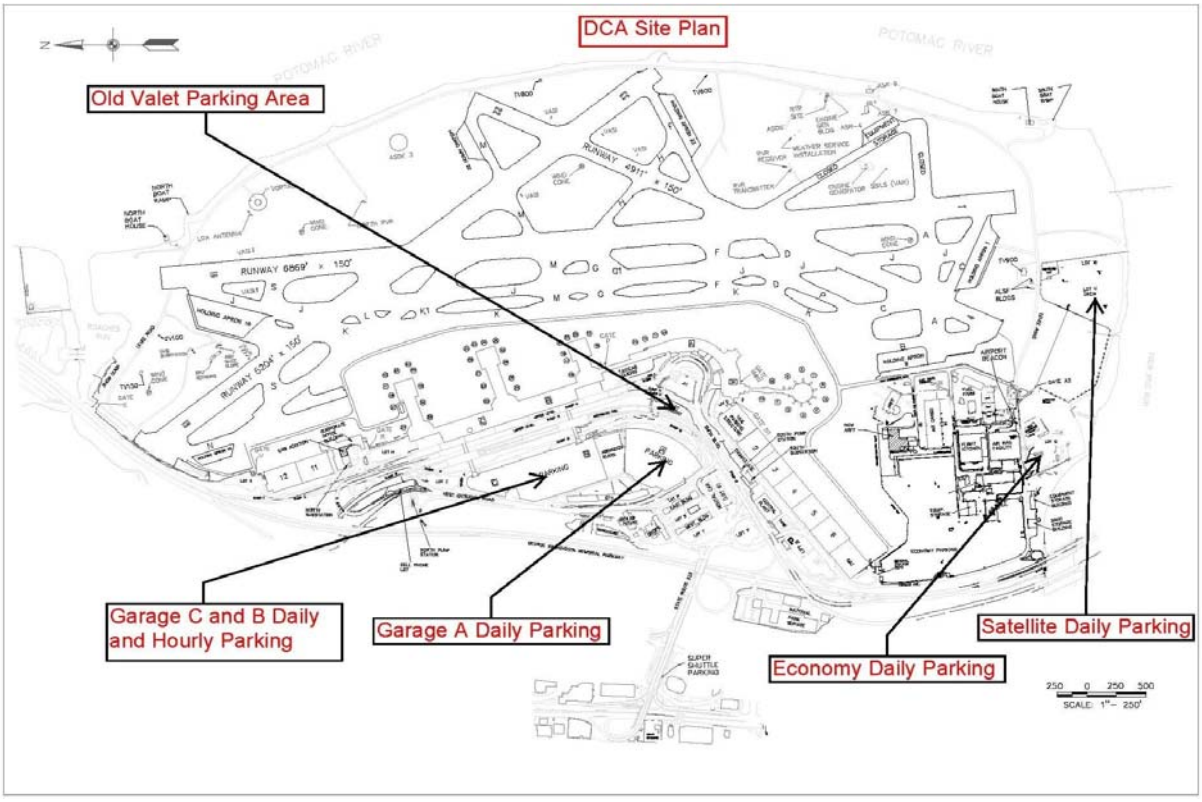
This document summarizes the site inventory of the existing Parking and Revenue Control System. A physical site inventory was conducted on February 26-27, 2009. Site inventory work was supported by Mirza Saeed, Henok Tsehaye, Syed Ali, and Don Griffin.

GENERAL FINDINGS

The following parking facilities were addressed in the site inventory:

1. Parking Garage A
2. Parking Garage B
3. Parking Garage C
4. Old Valet Parking
5. Economy Parking
6. Satellite Parking

The site layout plan below shows the locations of the parking structures at the Airport.


DCA Site Plan
Old Valet Parking Area
Garage C and B Daily and Hourly Parking
Garage A Daily Parking
Economy Daily Parking
Satellite Daily Parking

GARAGE A SITE INVENTORY

OVERVIEW

Garage A has two levels, A1 (ground) and A2 (1st level), for daily parking. Garage A also has two levels for Rental Car services (A3 and A4). Garage A is undergoing a construction project that is adding another level (A5) to the parking garage. This will rearrange the use of Garage A as follows: A1 will remain for public parking, A2 and A3 will become rental car levels, and A4 and A5 will become public parking levels.

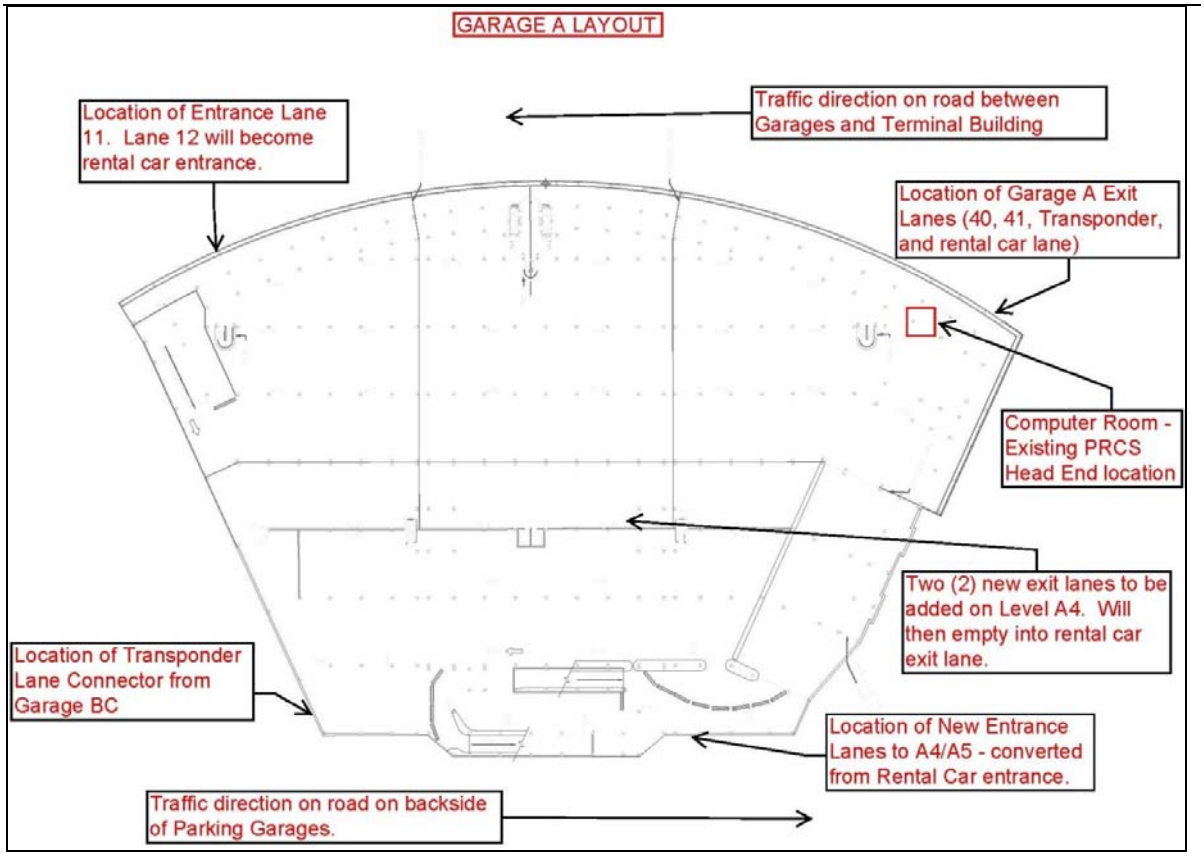
Garage A has two (2) entrance lanes, Lane 11 on the Ground Level (A1 Level) and Lane 12 on the 1st Level (A2 Level). In addition to public entry, Lane 11 has transponder access (use to be AVI, but was relocated). Lane 12 to Level A2 will become a rental car entrance lane and will be discontinued as a PRCS controlled lane. Garage A currently has 4 exit lanes on the Level A1, Lane 40 and 41 for patrons, a third transponder controlled exit lane, and a fourth open pass through rental car exit lane. To accommodate the new Level A5 and the converted Level A4, there will be a modified rental car entrance on the backside of the parking garage used as a PRCS entry lane. Additionally, there will be two (2) new exit lanes added to Level A4 to serve both A4 and A5. Once customers have exited these lanes, they will enter into the rental car flow of traffic exiting the Garage.

Garage A also has an interconnector from Garage B/C (Level 1) to Garage A (Ground Level – A1). Note Garage B/C Level 1 is at the same approximate elevation as Garage A ground Level. The interconnector is for transponder equipped non-public vehicles only. Garage A does not currently have a level counting system since the existing configuration has the public enter directly onto the level that they will park on. However, with the addition of Level A5, a level counting system will be required.

Space accounts for each of the levels are as follows:

1. Level A1 – 269 spaces
2. Level A2 – 478 spaces (but will be converted to rental car level
3. Level A4 – 460 (current rental car level)
4. Level A5 – 581 spaces (new level).

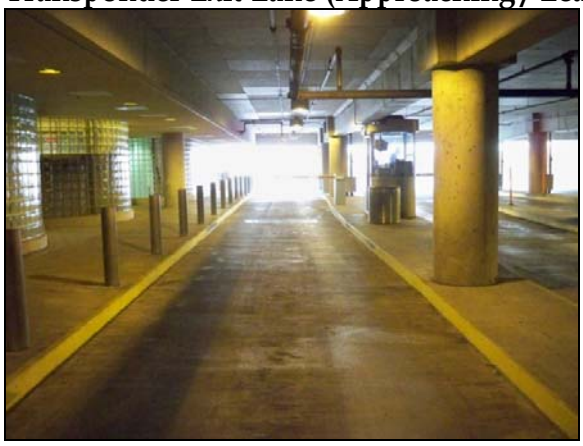
The diagram shows the general location of the Garage A entry / exit points and layout.


GARAGE A LAYOUT
Location of Entrance Lane 11. Lane 12 will become rental car entrance.
Traffic direction on road between Garages and Terminal Building
Location of Garage A Exit Lanes (40, 41, Transponder, and rental car lane)
Computer Room - Existing PRCS Head End location
Two (2) new exit lanes to be added on Level A4. Will then empty into rental car exit lane.
Location of Transponder Lane Connector from Garage BC
Location of New Entrance Lanes to A4/A5 - converted from Rental Car entrance.
Traffic direction on road on backside of Parking Garages.

Roadway Between Terminal Building and Garages (South / North)

Existing Garage A Exits

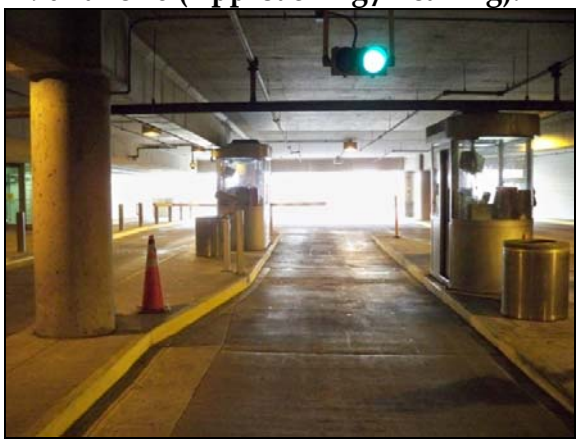
Transponder Exit Lane (Approaching / Leaving):



Lane includes the following features:

- 10′ wide Lane
- (2) Vehicle Loops – Present, Close
- Gate Arm and transponder receiver

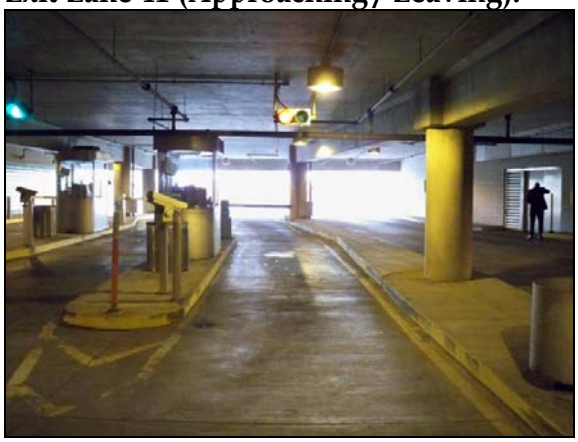
Exit Lane 40 (Approaching / Leaving):



Lane includes the following features:

- 9′ 6″ wide Lane
- Red/Green Lane Status
- (2) Vehicle Loops – Present, Close
- Gate Arm
- Exit Booth
- Patron Fare Display (on Gate Arm)
- LPI Camera (mounted 4′ high)

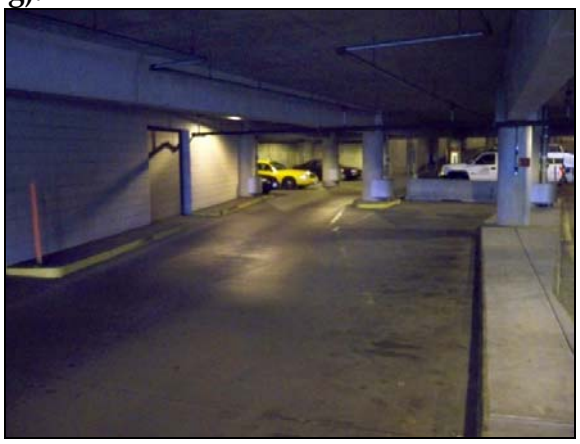
Exit Lane 41 (Approaching / Leaving):



Lane includes the following features:

- 9′ 6″ wide Lane
- Red/Green Lane Status
- (2) Vehicle Loops – Present, Close
- Gate Arm
- Exit Booth
- Patron Fare Display (on Gate Arm)
- LPI Camera (mounted 4′ high)

Rental Car Exit Lane (Approaching / Leaving):



Lane includes the following features:

- 16′ wide Lane
- No egress controls

Garage A Exit Booths:

Booth features include (left to right):

- Omnimatic Cashier Computer
- LPI Camera Controller
- Credit Card Reader (Ethernet connection)
- Duress Alarm (located on the side of Cashier Computer)
- Ticket Reader
- LPI Analog Display

Booth features continued (left to right):

- Cash Drawer
- Communications Cabinet
- Telephone

Booth features continued (left to right):

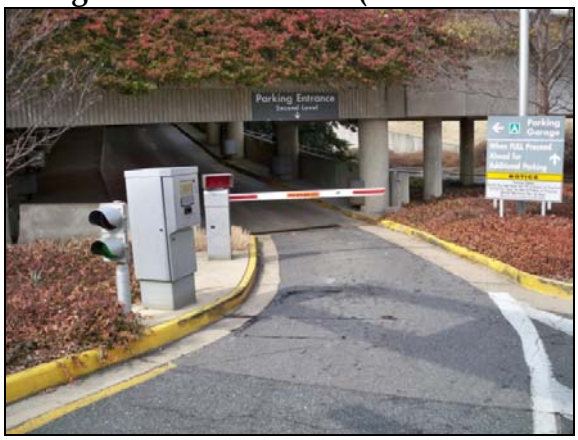
- Cashier Security Camera
- UPS (not shown)
- Gate Arm Controller (not shown)
- Patron Fare Display (located on Gate Arm outside booth)

Note: There is no intercom system currently in place at any of the entrance or exit lanes.

Note: Each exit booth, at all garages, has a 100 amp panel installed.

EXISTING GARAGE A ENTRANCE

Garage A Entrance Lanes (Lane 12 on left and Lane 11 on right)



Entrance Lane 12 up to Level A2 includes:

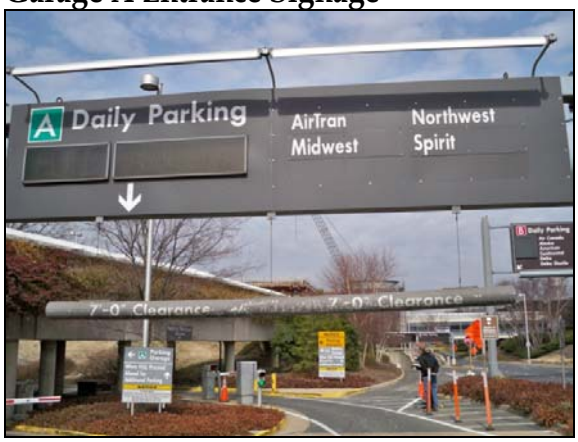
- 10′ wide lane
- Red/Green Lane Indicator Light
- Ticket Spitter (Magnetic Automation Corp.)
- Gate Arm
- Lot Full Sign (light bulb illuminated)
- (3) Vehicle Loops – Present, Back-out, Close

Note: Lane 12 will become rental car entry point

Entrance Lane 11 to Level A1 includes:

- 10′ wide lane
- Red/Green Lane Indicator Light
- Ticket Spitter
- Gate Arm and transponder receiver
- Lot Full Sign (light bulb illuminated)
- (3) Vehicle Loops – Present, Back-out, Close

Garage A Entrance Signage

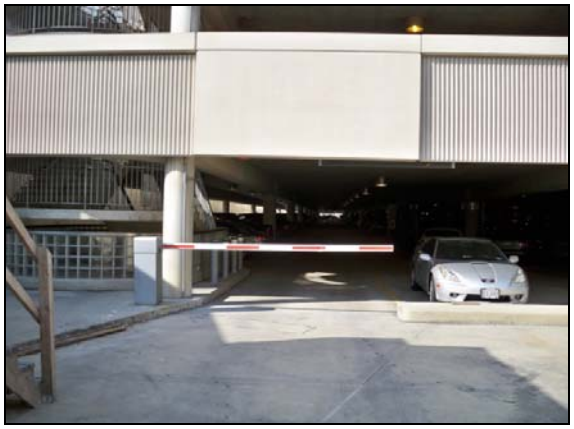


Dynamic Signage for Garage A entrance includes:

- Lot "Full" Sign (on left)
- "Park at B" Sign (second to left)
- ADA "See Attendant" sign (far right) for handicap parking spaces when lot is full, but handicap parking spaces remain. Note: Entrance is physically manned when lot is full to handle handicap parking access.

EXISTING GARAGE A – GARAGE BC CONNECTOR

Transponder Connector Lane (Approaching / Leaving)



The Transponder Connector Lane includes:

- 11' wide lane
- (2) Vehicle Loops – Present, Close
- Gate Arm and transponder receiver

Note: This location has power only; no communications pathway.

GARAGE B/ GARAGE C

OVERVIEW

Garage B and Garage C are one parking facility with a shared exit, but separate entrances. Garage BC includes a total of six (6) levels: Ground Level, Level 1-4, and a new Level 5. The B side (south) of Garage BC has four (4) daily parking entrances: Lane 1 and 2 and Lane 3 and 4. Lane 1 and 2 enter Garage BC on the Ground Level and include AVI access. Lane 3 and 4 enter Garage BC on Level 1. Also, on the south side of the Garage (B side), there is an upward vehicle Helix to change garage levels. The South Helix starts on the Ground Level and ends on the new Level 5. The Transponder Connector lane to Garage A is also on the south side of Garage BC.

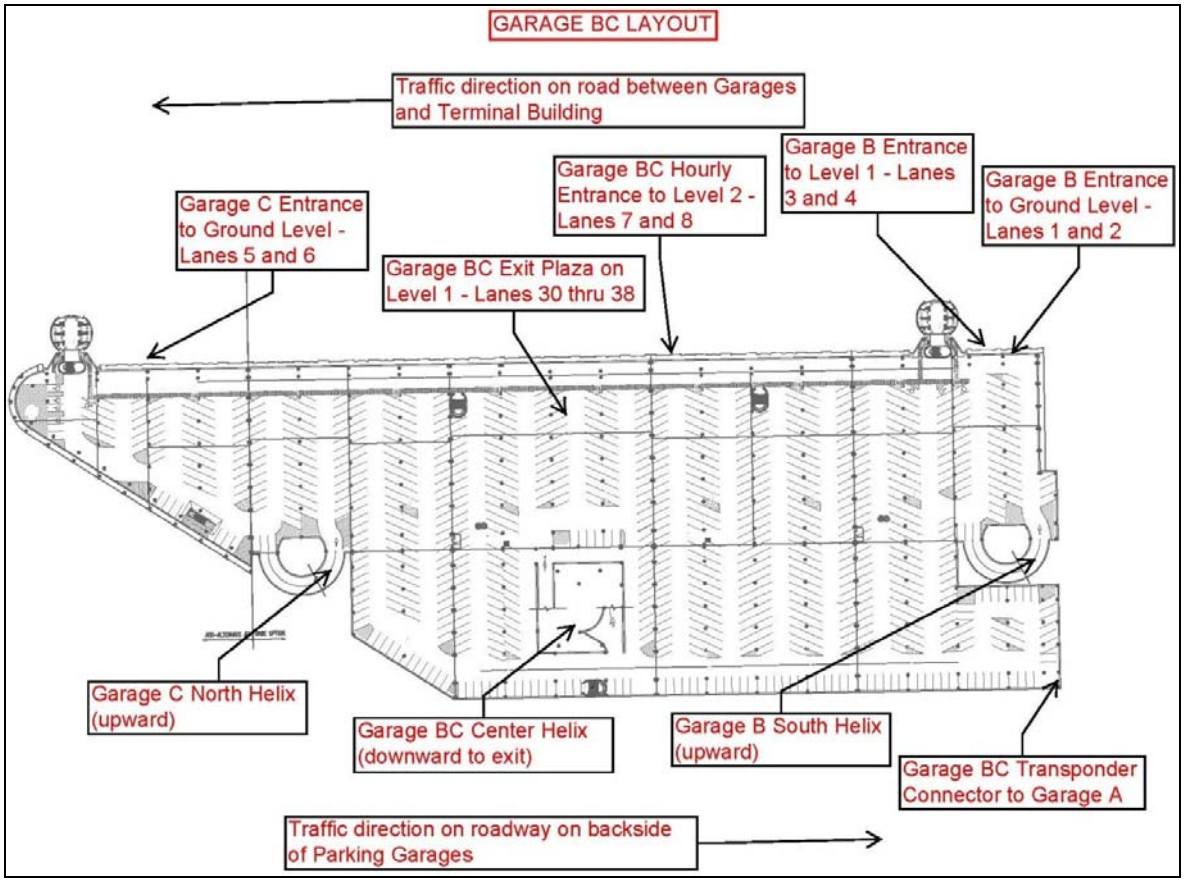
On the North side of Garage BC (C side of Garage), there is two (2) daily entrance lanes. The Garage C entrance lanes are Lane 5 and 6 and enter the garage on the Ground Level. Also, on the Garage C side of Garage BC is another upward headed vehicle Helix to access other garage levels. The North Helix starts on the Ground Level and ends on the new Level 5; however, there are only a few spaces accessible on Level 2 due to hourly parking on this Level. Both the North and South Helix include vehicle count loops and control arms with the exception of Level 2 to 3 on the North Helix and Level 4 to 5 on both North and South (needs to be added; was not included in new construction).

The center of Garage BC includes an East/West downward vehicle Exit Helix, a nine (9) lane exit plaza, and two (2) hourly entrance lanes. The Exit Helix does not have level counting system as you cannot re-enter at a new level, but must exit Garage once in the Helix. The Exit Plaza includes Lanes 30 through 38 and is located on Level 1. The Hourly Entrance Lanes are Lanes 7 and 8 and enter onto Level 2 of Garage BC. A portion of Level 2 is segmented off for Hourly parking only.

Space accounts for each of the levels are as follows:

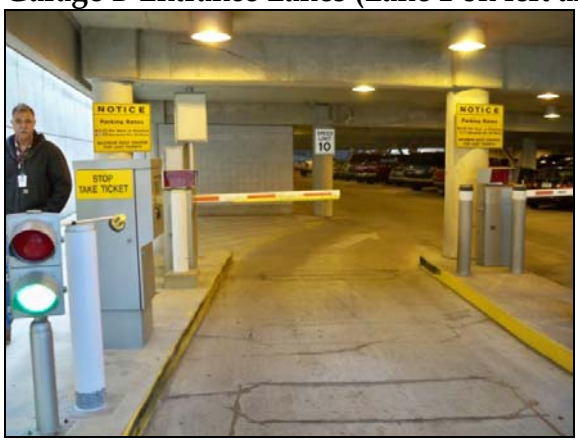
1. Ground Level – 695 spaces
2. Level 1 – 839 spaces
3. Level 2 (Daily) – 365 spaces
4. Level 2 (Hourly) – 448 spaces
5. Level 3 – 1025 spaces
6. Level 4 – 454 spaces
7. Level 5 – 500 spaces

The diagram shows the general location of the Garage BC entry / exit points and layout.


GARAGE BC LAYOUT
Traffic direction on road between Garages and Terminal Building
Garage C Entrance to Ground Level - Lanes 5 and 6
Garage BC Hourly Entrance to Level 2 - Lanes 7 and 8
Garage B Entrance to Level 1 - Lanes 3 and 4
Garage B Entrance to Ground Level - Lanes 1 and 2
Garage BC Exit Plaza on Level 1 - Lanes 30 thru 38
Garage C North Helix (upward)
Garage BC Center Helix (downward to exit)
Garage B South Helix (upward)
Garage BC Transponder Connector to Garage A
Traffic direction on roadway on backside of Parking Garages

GARAGE B DAILY ENTRANCE

Garage B Entrance Lanes (Lane 1 on left and Lane 2 on right)



Entrance Lane 1 to Ground Level includes:

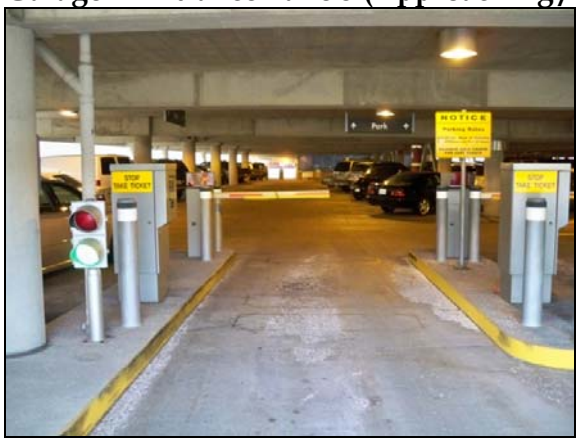
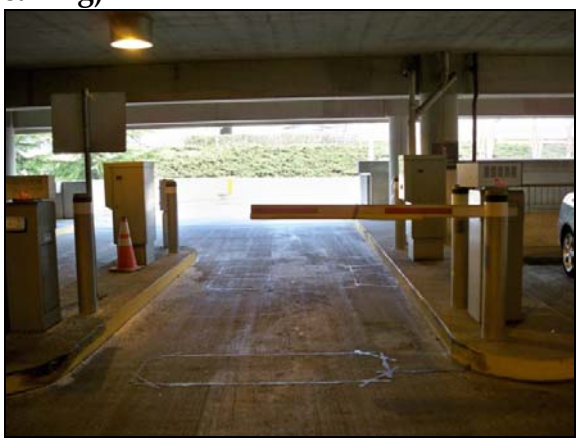
- 9′ 6″ wide lane
- Red/Green Lane Indicator Light
- Ticket Spitter
- Gate Arm
- Lot Full Sign (light bulb illuminated)
- (3) Vehicle Loops – Present, Back-out, Close
- AVI vehicle access receiver

Note: Lane 1 is also designated as AVI Lane 60

Entrance Lane 2 to Ground Level includes:

- 9′ 6″ wide lane
- Red/Green Lane Indicator Light
- Ticket Spitter
- Gate Arm
- Lot Full Sign (light bulb illuminated)
- (3) Vehicle Loops – Present, Back-out, Close

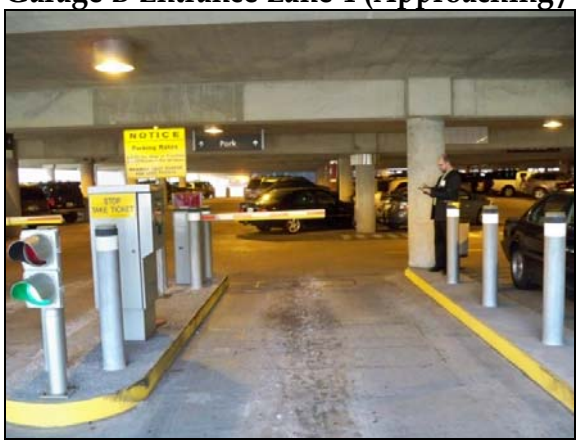
Garage B Entrance Lane 3 (Approaching / Leaving)

Entrance Lane 3 to Level 1 includes:

- 9′ 6″ wide lane
- Red/Green Lane Indicator Light
- Ticket Spitter
- Gate Arm
- Lot Full Sign (light bulb illuminated)
- (3) Vehicle Loops – Present, Back-out, Close

Garage B Entrance Lane 4 (Approaching / Leaving):



Entrance Lane 3 to Level 1 includes:

- 9′ 6″ wide lane
- Red/Green Lane Indicator Light
- Ticket Spitter
- Gate Arm
- Lot Full Sign (light bulb illuminated)
- (3) Vehicle Loops – Present, Back-out, Close

Garage B Daily Entrance:

Down ramp toward entrance Lane 1 and 2 and up ramp toward entrance Lane 3 and 4. Sign includes:

- (2) Red 'X' / Green check mark LEDs (one for each entrance ramp)
- "Full" "Use Economy" Sign
- ADA "See Attendant" sign for handicap parking spaces when lot is full, but handicap parking spaces remain.

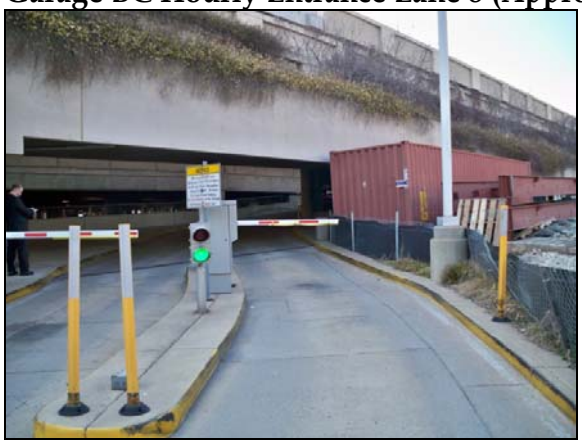
GARAGE BC HOURLY ENTRANCE

Garage BC Hourly Entrance Lane 7 (Approaching / Leaving)

Entrance Lane 7 to Level 2 includes:

- 9' wide lane
- Red/Green Lane Indicator Light
- Ticket Spitter
- Gate Arm
- Lot Full Sign (light bulb illuminated)
- (3) Vehicle Loops – Present, Back-out, Close

Garage BC Hourly Entrance Lane 8 (Approaching / Leaving):



Entrance Lane 8 to Level 2 includes:

- 8′ 6″ wide lane
- Red/Green Lane Indicator Light
- Ticket Spitter
- Gate Arm
- Lot Full Sign (light bulb illuminated)
- (3) Vehicle Loops – Present, Back-out, Close

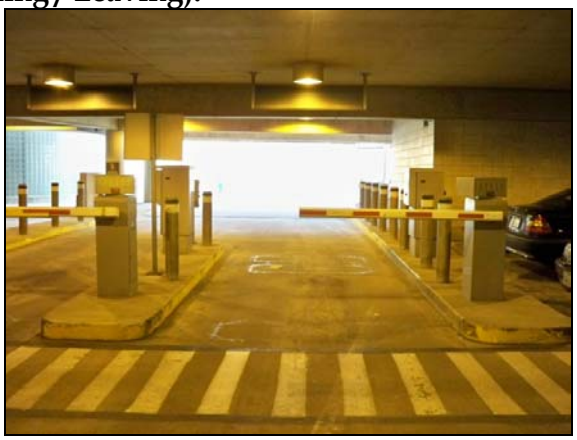
Garage BC Hourly Entrance:

Ramp toward hourly entrance Lane 7 and 8. Picture to right shows view back toward Level Exit as you head up to Level 2 hourly parking. Entrance sign includes:

- "Full" Sign
- ADA "See Attendant" sign for handicap parking spaces when lot is full, but handicap parking spaces remain.

GARAGE C DAILY ENTRANCE

Garage C Daily Entrance Lane 5 (Approaching / Leaving):



Entrance Lane 5 to Ground Level includes:

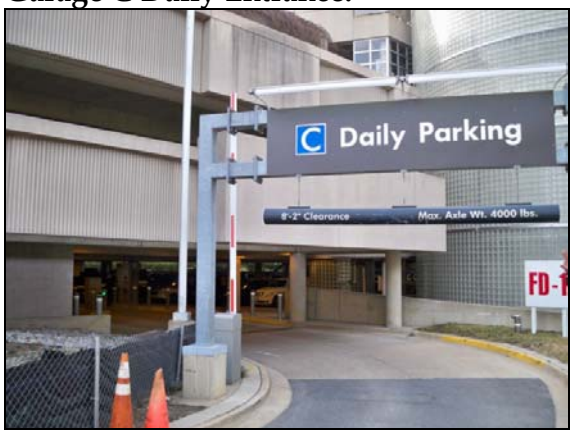
- 10’ wide lane
- Red/Green Lane Indicator Light
- Ticket Spitter
- Gate Arm
- Lot Full Sign (light bulb illuminated)
- (3) Vehicle Loops – Present, Back-out, Close

Garage C Daily Entrance Lane 6 (Approaching / Leaving)

Entrance Lane 6 to Ground Level includes:

- 10' wide lane
- Red/Green Lane Indicator Light
- Ticket Spitter
- Gate Arm
- Lot Full Sign (light bulb illuminated)
- (3) Vehicle Loops – Present, Back-out, Close

Garage C Daily Entrance:

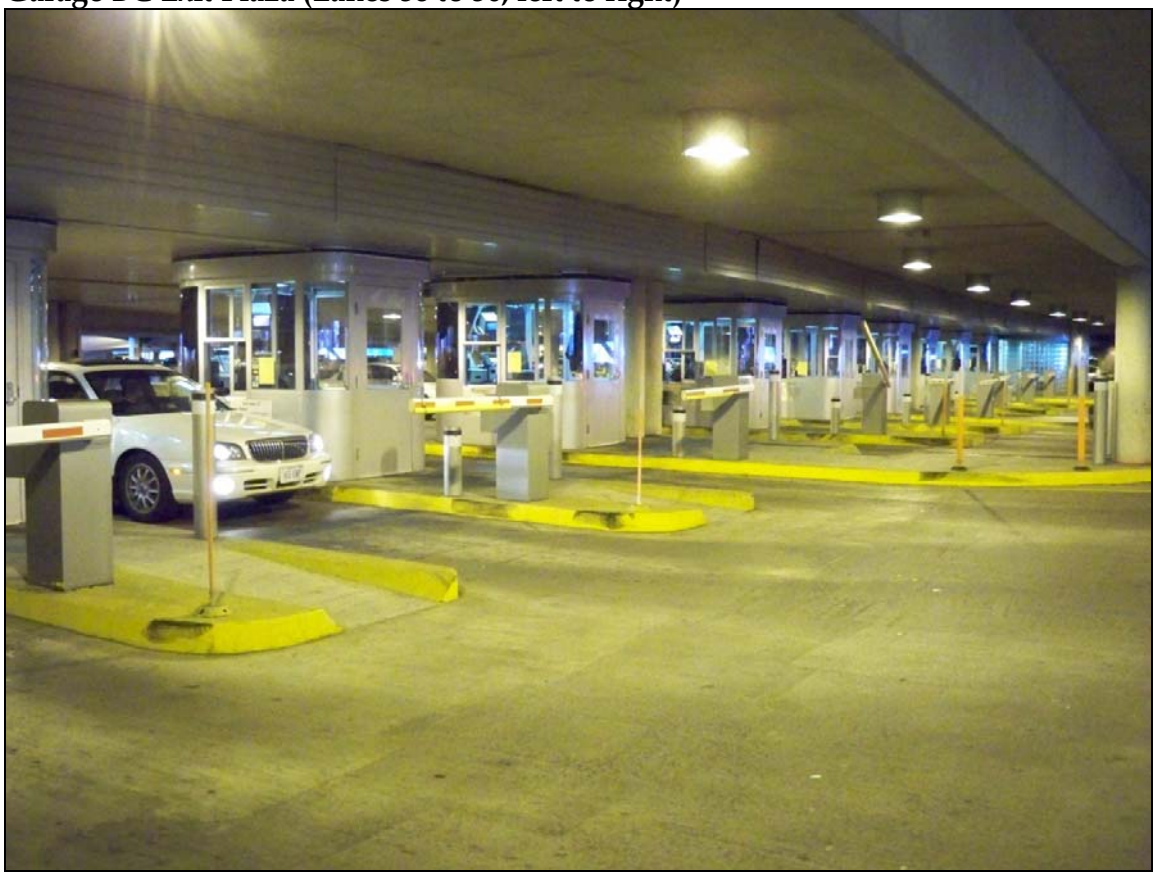


Ramp toward daily entrance Lane 5 and 6. Picture to right shows main road sign for C Garage. Sign includes:

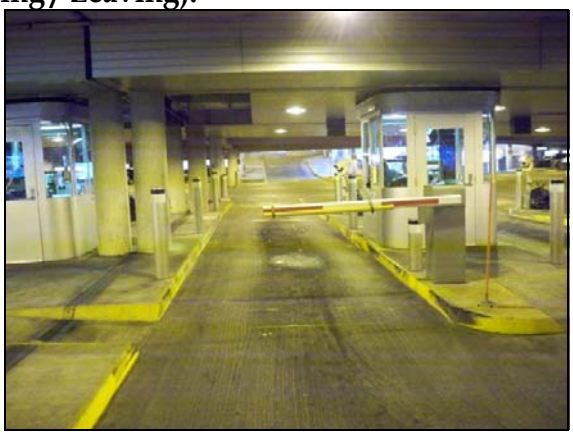
- "Full" Sign
- ADA "See Attendant" sign for handicap parking spaces when lot is full, but handicap parking spaces remain.

GARAGE BC EXIT

Garage BC Exit Plaza (Lanes 38 to 30, left to right)



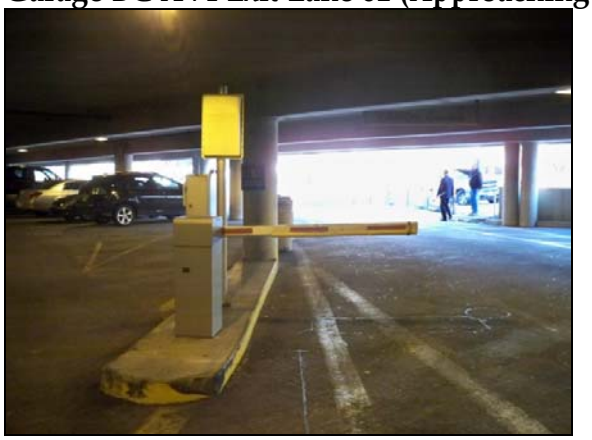
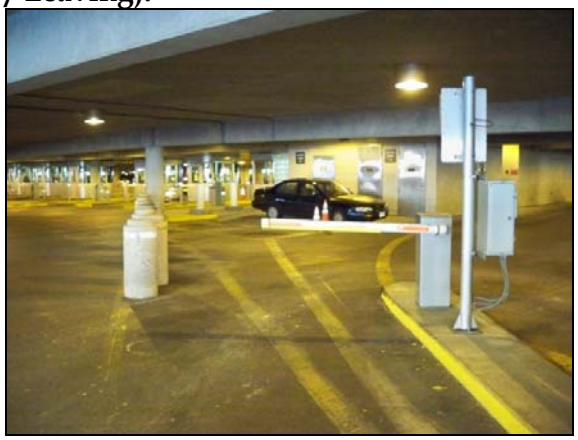
Garage BC Exit Lanes (Typical – Approaching / Leaving):



Typical lane includes the following features:

- 9′ wide Lane (except for Lane 38 – 9′6″)
- Red/Green Lane Status Indicator (overhead)
- (2) Vehicle Loops – Present, Close
- Gate Arm
- Exit Booth
- Patron Fare Display (on Gate Arm)
- LPI Camera (mounted 4′ high)

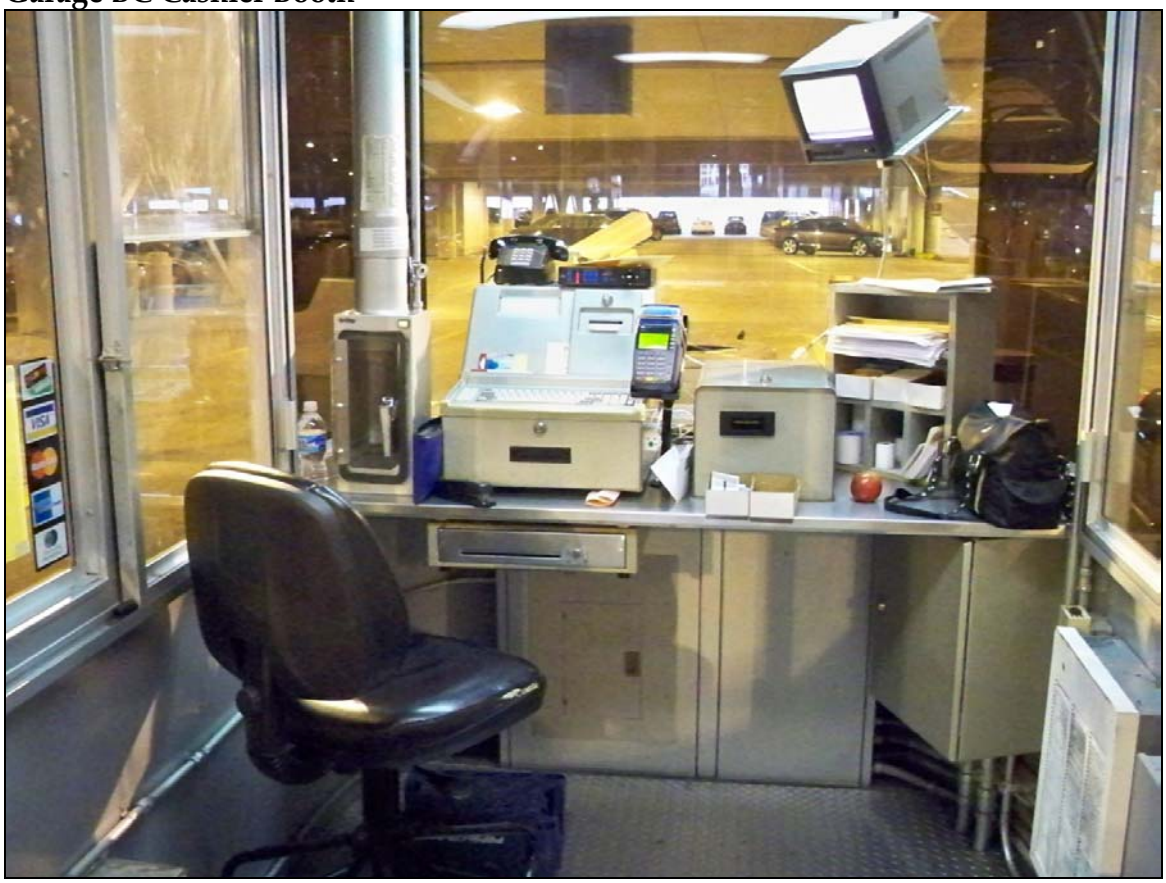
Garage BC AVI Exit Lane 61 (Approaching / Leaving):

Lane 61 includes the following features:

- (2) Vehicle Loops – Present, Close
- Gate Arm
- AVI receiver

Garage BC Cashier Booth



Booth features include (left to right):

- Money transfer tube
- Cash Drawer
- Omnimatic Cashier Computer
- Telephone
- LPI Camera Controller
- Credit Card Reader (Ethernet connection)
- Duress Alarm (located on the side of Cashier Computer)
- Ticket Reader
- LPI Analog Display
- Communications Cabinet
- Cashier Security Camera (not shown)
- UPS (not shown)

GARAGE B (SOUTH) HELIX

Level 1 Access Control

Left lane in picture provides return access into Helix to head to Level 2 and includes the following features:

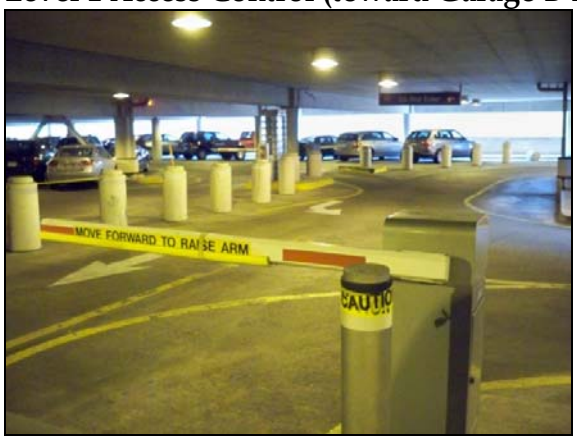
- Gate arm
- (2) Vehicle Loops – Present (opens arm when lot is full), Close

Right lane in picture provides controlled access to Level 1 and includes the following features:

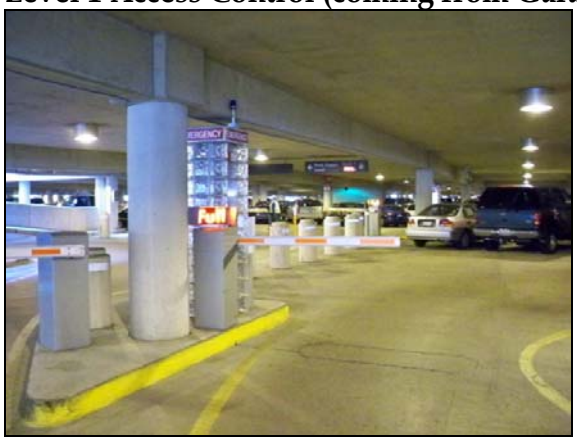
- Gate arm
- (1) Vehicle Loop – Close/Safety
- Neon Level "Full" sign overhead
- Lot Full Sign (light bulb illuminated) mounted on gate arm

Note: On the Ground Level, entering into the Helix, is a Vehicle Count Loop.

Level 1 Access Control (toward Garage B Level 1 entrance – Helix located to right)



Level 1 Access Control (coming from Garage B Level 1 entrance – Lanes 3 and 4)



Left lane on edge of picture provides access into Helix to head to Level 2 and includes the following features:

- Gate arm
- (2) Vehicle Loops – Present (opens arm when lot is full), Close

Right lane in picture provides controlled access to Level 1 and includes the following features:

- Gate arm
- (1) Vehicle Loop – Close/Safety
- Lot Full Sign (light bulb illuminated) mounted on gate arm

Level 2 Access Control

Left lane in picture provides return access into Helix to head to Level 3 and includes the following features:

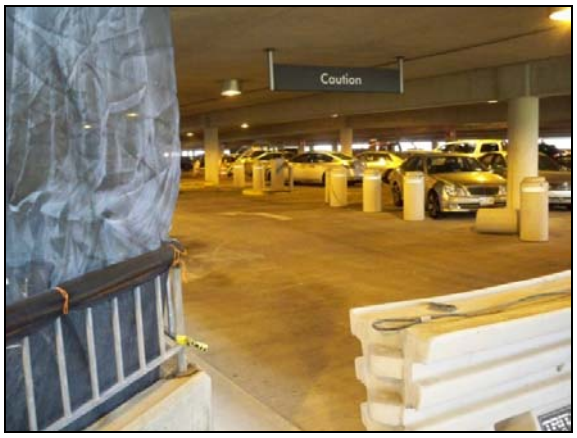
- Gate arm
- (2) Vehicle Loops – Present (opens arm when lot is full), Close

Right lane in picture provides controlled access to Level 2 and includes the following features:

- Gate arm
- (1) Vehicle Loop – Close/Safety
- Lot Full Sign (light bulb illuminated) mounted on gate arm

Note: On the Level 1, entering into the Helix, is a Vehicle Count Loop.

Level 3 Access Control



Left picture provides controlled access to Level 3 and includes the following features:

- Gate arm
- (1) Vehicle Loop – Close/Safety
- Lot Full Sign (light bulb illuminated) mounted on gate arm

Right picture (in distant and center) provides return access into Helix to head to Level 4 and includes the following features:

- Gate arm
- (2) Vehicle Loops – Present (opens arm when lot is full), Close

Note: On the Level 2, entering into the Helix, is a Vehicle Count Loop.

Ramp up to Level 4 (closed for construction)

Vehicle Count Loop to Level 4 behind construction fence.

South Helix Vehicle Count Loop

There is a vehicle count loop located on the up ramp on the following levels in the South Helix:

- Ground Level (up to Level 1)
- Level 1 (up to Level 2)
- Level 2 (up to Level 3)
- Level 3 (up to Level 4)

Note: Level 4 (up to Level 5) does not have a vehicle ground loop, however, needs to be included.

GARAGE C (NORTH) HELIX

Level 1 Access Control

Lane in picture (left, center) provides return access into Helix to head to Level 2 and includes the following features:

- Gate arm
- (2) Vehicle Loops – Present (opens arm when lot is full), Close

Level 1 entry control gate not shown, but includes the following features:

- Gate arm
- (1) Vehicle Loop – Close/Safety
- Lot Full Sign (light bulb illuminated) mounted on gate arm

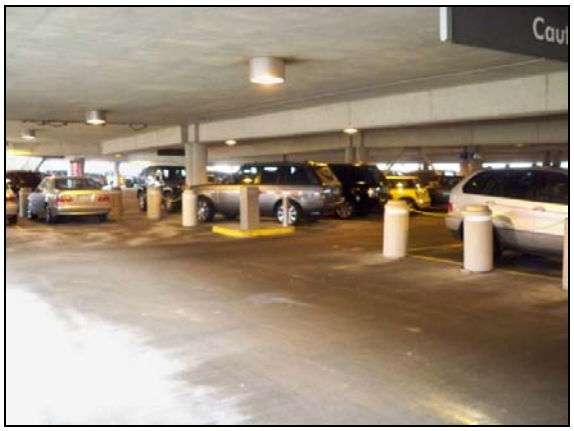
Note: On the Ground Level, entering into the Helix, is a Vehicle Count Loop.

Level 2 Access Control

There is no entry / exit onto Level 2 from North Helix due to hourly parking. There are a few immediate parking spaces, otherwise, all traffic from Level 1 is directed straight to Level 3.

There is a Vehicle Count Loop on the Level 1 ramp up to Level 2. There is no Vehicle Count Loop on Level 2 ramp up to Level 3 as it is not required.

Level 3 Access Control



Left lane in picture provides return access into Helix to head to Level 4 and includes the following features:

- Gate arm
- (2) Vehicle Loops – Present (opens arm when lot is full), Close

Right lane in picture provides controlled access to Level 3 and includes the following features:

- Gate arm
- (1) Vehicle Loop – Close/Safety
- Neon Level "Full" sign overhead
- Lot Full Sign (light bulb illuminated) mounted on gate arm

Note: As noted earlier, on Level 1, entering into the Helix, is a Vehicle Count Loop, but there is not one on Level 2.

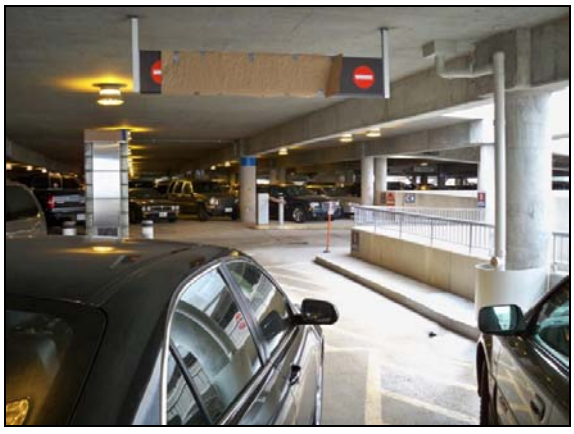
Level 4 Access Control

The lane in picture provides access onto Level 4 and includes the following features:

- Gate arm
- (2) Vehicle Loops – Present, Close

Note: On Level 3, entering into the Helix, is a Vehicle Count Loop.

Level 4 Access Flow Problem



The picture on left shows Level 4 as you exit the Helix. To the right of this picture is the up ramp Helix to Level 5. Problems include:

- No Vehicle Count Loop as you enter Helix to Level 5
- No pass through access from Level 3 to Level 5, when Level 4 is full
- Level 4 access gate arm is located at head of Helix ramp
- No Level "Full" signage
- Emergency phone is in traffic flow to Level 5

North Helix Vehicle Count Loop

There is a vehicle count loop located on the up ramp on the following levels in the South Helix:

- Ground Level (up to Level 1)
- Level 1 (up to Level 3)
- Level 3 (up to Level 4)

Note: Level 4 (up to Level 5) does not have a vehicle ground loop, however, needs to be included.

OTHER PARKING FACILITIES

OLD VALET LOT

The Old Valet Lot is not currently used, but has 116 available spaces. The lot is a surface parking area. The lot has one entrance and one exit.

Valet Entrance (Approaching / Leaving)

Entrance Lane includes:

- 11' wide lane
- Gate Arm
- Lot Full Sign (light bulb illuminated)
- (2) Vehicle Loops – Present, Close

Valet Exit (Approaching / Leaving)

Lane includes the following features:

- 11' wide lane
- (2) Vehicle Loops – Present, Close
- Gate Arm
- Exit Booth

ECONOMY LOT

The economy lot is a surface level parking lot. The lot has 2 public entrances (Lanes 16 and 17) and 2 public exits (Lanes 45 and 46) located together. Additionally, the economy lot has a separate AVI entrance/exit (Lanes 66 and 67) for the shuttle service to and from the Terminal Buildings. The economy lot has a total of 2956 spaces.

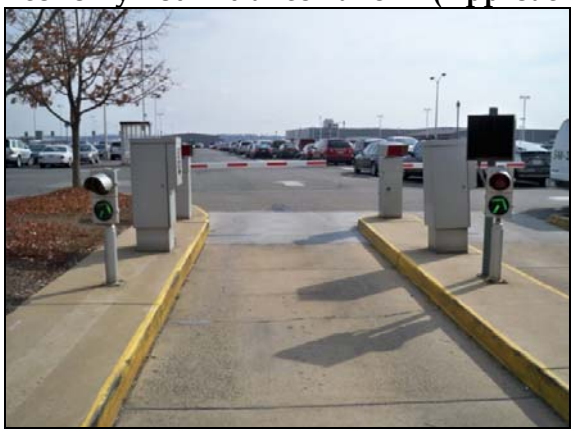
Economy Lot Entrance Lane 16 (Approaching / Leaving)

Entrance Lane includes:

- 9' wide lane
- Red/Green Lane Indicator Light
- Ticket Spitter
- Gate Arm
- Lot Full Sign (light bulb illuminated)
- (3) Vehicle Loops – Present, Back-out, Close

Between the entrance lanes is the ADA "See Attendant" sign for handicap parking spaces when lot is full, but handicap parking spaces remain.

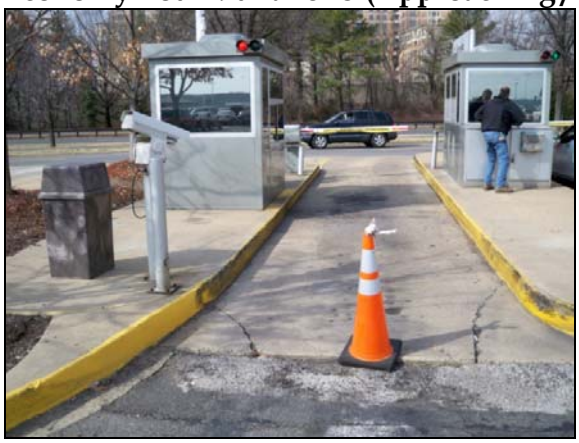
Economy Lot Entrance Lane 17 (Approaching / Leaving)



Entrance Lane includes:

- 9′ wide lane
- Red/Green Lane Indicator Light
- Ticket Spitter
- Gate Arm
- Lot Full Sign (light bulb illuminated)
- (3) Vehicle Loops – Present, Back-out, Close

Economy Lot Exit Lane 45 (Approaching / Leaving)



Exit Lane includes the following features:

- 8′ 6″ wide Lane
- Red/Green Lane Status
- (2) Vehicle Loops – Present, Close
- Gate Arm
- Exit Booth
- Patron Fare Display (on Gate Arm)
- LPI Camera (mounted 4′ high)

Economy Lot Exit Lane 46 (Approaching/ Leaving)

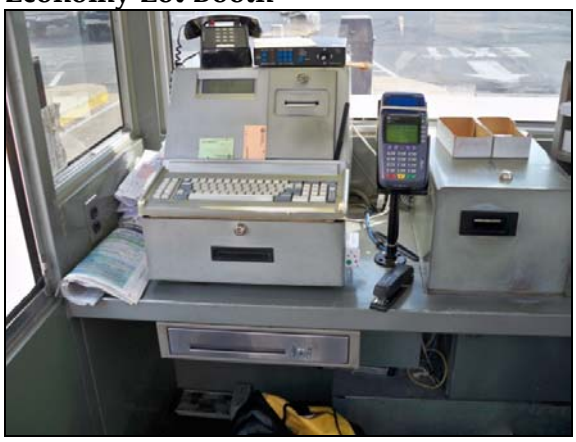
Exit Lane includes the following features:

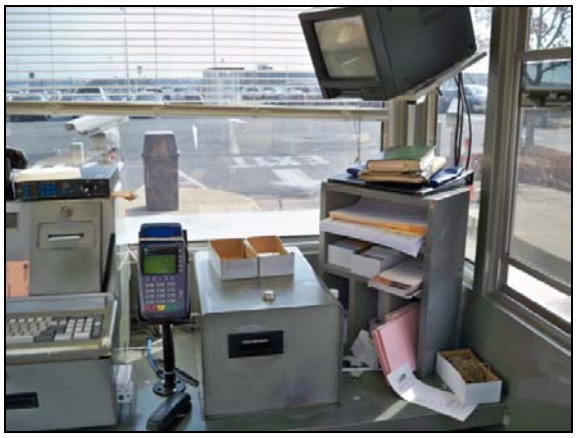
- 8′ 6″ wide Lane
- Red/Green Lane Status
- (2) Vehicle Loops – Present, Close
- Gate Arm
- Exit Booth
- Patron Fare Display (on Gate Arm)
- LPI Camera (mounted 4′ high)

Economy Lot Entrance Road Sign

Sign includes lot "Full" indication and is located on the Exit Booth island above.

Economy Lot Booth





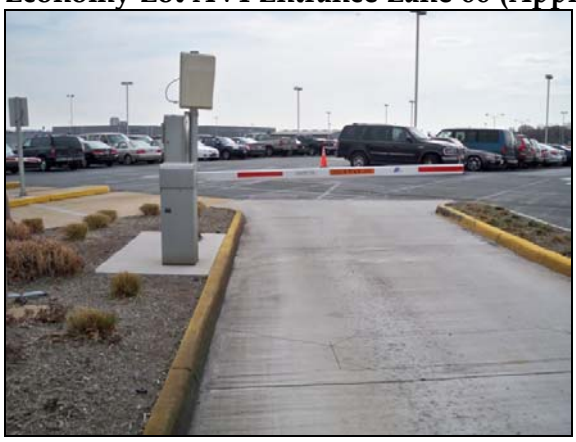
Booth features include (left to right):

- Omnimatic Cashier Computer
- Cash Drawer
- Telephone
- LPI Camera Controller
- Duress Alarm (located on the side of Cashier Computer)
- Credit Card Reader (Ethernet connection)
- Ticket Reader
- LPI Analog Display

Booth features include (left to right):

- Communications Cabinet
- Cashier Security Camera
- UPS (not shown)

Economy Lot AVI Entrance Lane 66 (Approaching / Leaving)



Lane includes the following features:

- 12′ wide lane
- (2) Vehicle Loops – Present, Close
- Gate Arm
- AVI receiver

Economy Lot AVI Exit Lane 67 (Approaching / Leaving)

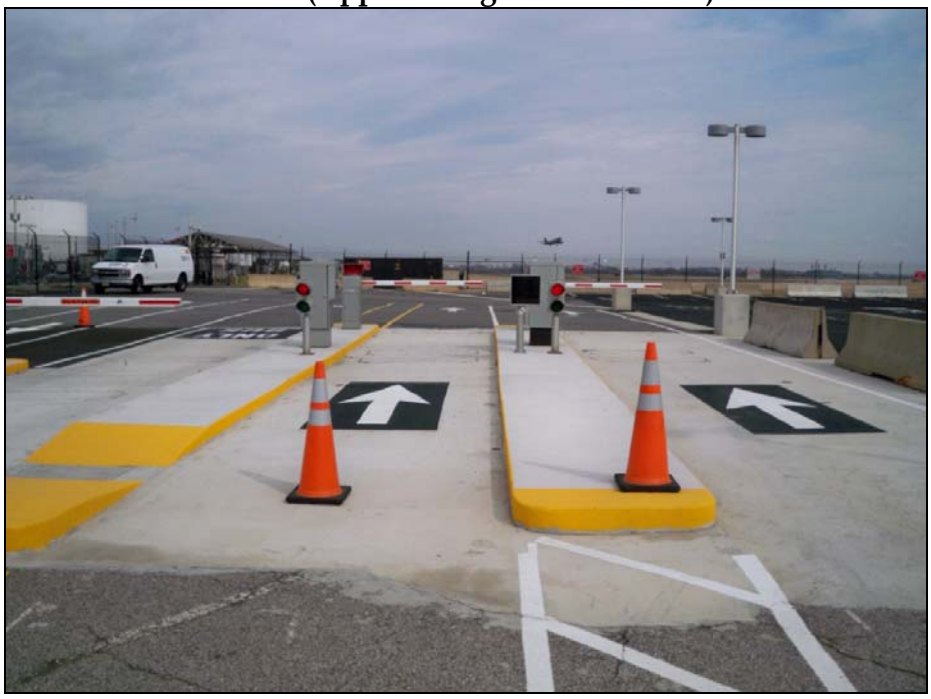
Lane includes the following features:

- 12′ wide lane
- (2) Vehicle Loops – Present, Close
- Gate Arm
- AVI receiver

SATELLITE LOT

The Satellite Lot is not currently in use, but is the newest parking facility. The Lot is a surface parking facility and includes 2 public entrance lanes (Lane 14 and 15) and 2 public exit lanes (Lane 43 and 44) located adjacent to each other. Additionally, the lot has a separate AVI entrance lane (Lane 62) plus an AVI exit (Lane 63). The AVI exit is located between the public entrance and exit lanes. The Satellite lot has a total of 877 spaces.

Satellite Lot Entrance (Approaching Lane 15 and 14)



Entrance Lanes include:

- Lane 15 on left - 9′ wide; Lane 14 on right flexible lane width
- Red/Green Lane Indicator Light
- Ticket Spitter
- Gate Arm
- Lot Full Sign (light bulb illuminated)
- (3) Vehicle Loops – Present, Back-out, Close
- Between the entrance lanes is the ADA "See Attendant" sign for handicap parking spaces when lot is full, but handicap parking spaces remain.

Satellite Lot Entrance (Leaving Lane 14 and 15)*

*See lane configuration on previous page.

Satellite Lot Exit – Lane 15 (Approaching / Leaving)

Exit Lane includes the following features:

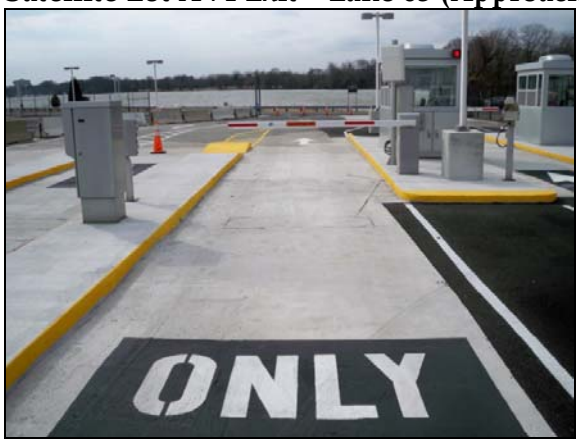
- 11’ wide Lane to fence
- Red/Green Lane Status
- (2) Vehicle Loops – Present, Close
- Gate Arm
- Exit Booth
- Patron Fare Display (on Gate Arm)
- LPI Camera (mounted 4’ high)

Satellite Lot Exit – Lane 14 (Approaching / Leaving)

Exit Lane includes the following features:

- 9′ wide Lane to fence
- Red/Green Lane Status
- (2) Vehicle Loops – Present, Close
- Gate Arm
- Exit Booth
- Patron Fare Display (on Gate Arm)
- LPI Camera (mounted 4′ high)

Satellite Lot AVI Exit – Lane 63 (Approaching / Leaving)



Lane includes the following features:

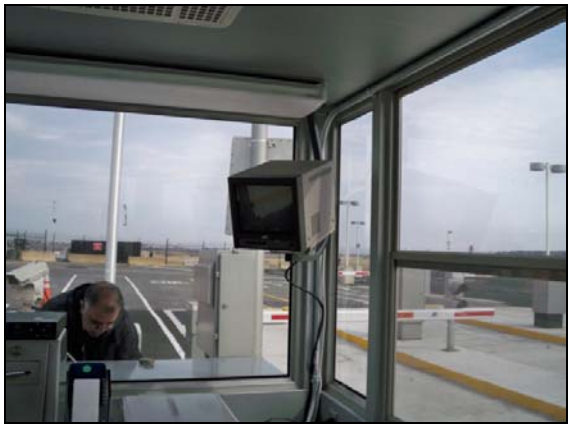
- 10′ wide lane
- (2) Vehicle Loops – Present, Close
- Gate Arm
- AVI receiver

Satellite Lot AVI Entrance – Lane 62 (Leaving)

Lane includes the following features:

- 12′ wide lane
- (2) Vehicle Loops – Present, Close
- Gate Arm
- AVI receiver

Satellite Lot Main Plaza Booths

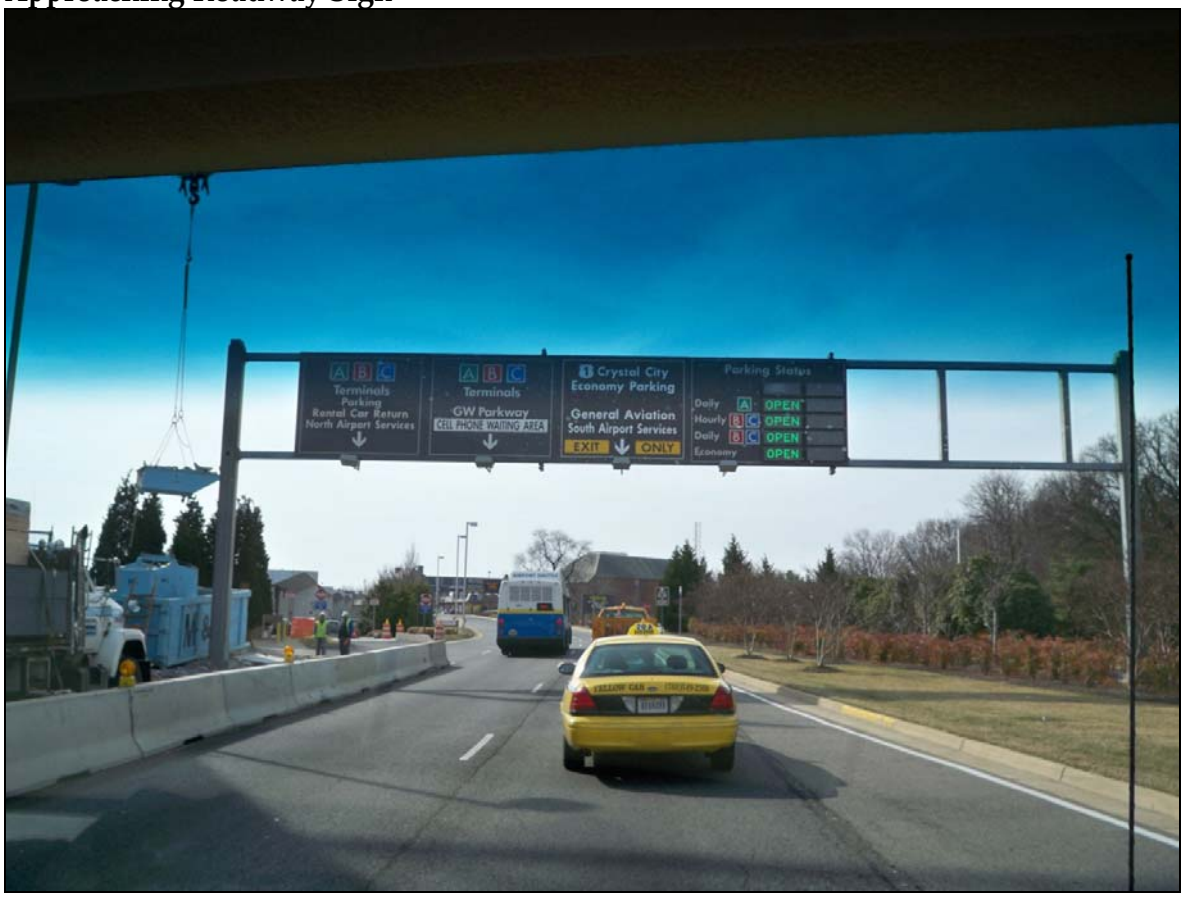


Booth features include (left to right):

- Telephone
- Omnimatic Cashier Computer
- Cash Drawer
- LPI Camera Controller
- No Duress Alarm installed
- Credit Card Reader (Ethernet connection)
- Ticket Reader
- Communications Cabinet
- LPI Analog Display
- Cashier Security Camera and UPS (not shown)

INCOMING ROADWAY SIGN

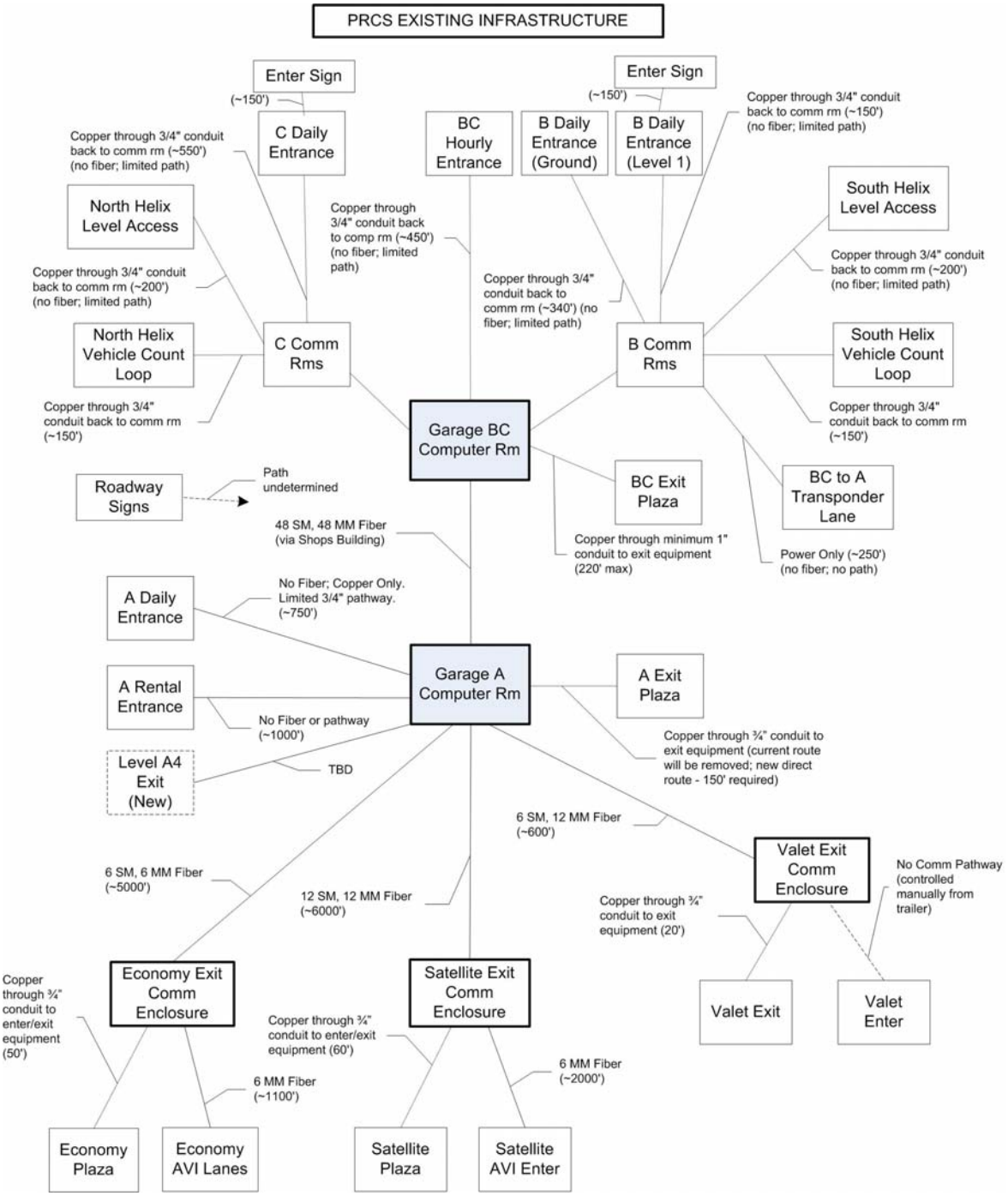
Approaching Roadway Sign



This is the second of two overhead roadway signs that indicate parking lot status. "Open" and "Full" LED signs are provided for Garage A, Garage BC Hourly, Garage BC Daily, and Economy Lot. The Satellite Lot and Valet are not included.

PRCS COMMUNICATION INFRASTRUCTURE

OVERVIEW


PRCS EXISTING INFRASTRUCTURE
Enter Sign
(~150')
C Daily Entrance
Copper through 3/4" conduit back to comm rm (~550') (no fiber; limited path)
North Helix Level Access
Copper through 3/4" conduit back to comm rm (~200') (no fiber; limited path)
North Helix Vehicle Count Loop
Copper through 3/4" conduit back to comm rm (~150')
Copper through 3/4" conduit back to comp rm (~450') (no fiber; limited path)
C Comm Rms
BC Hourly Entrance
Enter Sign
(~150')
B Daily Entrance (Ground)
B Daily Entrance (Level 1)
Copper through 3/4" conduit back to comm rm (~150') (no fiber; limited path)
Copper through 3/4" conduit back to comm rm (~340') (no fiber; limited path)
B Comm Rms
South Helix Level Access
Copper through 3/4" conduit back to comm rm (~200') (no fiber; limited path)
South Helix Vehicle Count Loop
Copper through 3/4" conduit back to comm rm (~150')
Garage BC Computer Rm
Roadway Signs
Path undetermined
BC Exit Plaza
Copper through minimum 1" conduit to exit equipment (220' max)
BC to A Transponder Lane
Power Only (~250') (no fiber; no path)
48 SM, 48 MM Fiber (via Shops Building)
A Daily Entrance
No Fiber; Copper Only. Limited 3/4" pathway. (~750')
A Rental Entrance
No Fiber or pathway (~1000')
Level A4 Exit (New)
TBD
Garage A Computer Rm
A Exit Plaza
Copper through ¾" conduit to exit equipment (current route will be removed; new direct route - 150' required)
6 SM, 12 MM Fiber (~600')
Valet Exit Comm Enclosure
No Comm Pathway (controlled manually from trailer)
Copper through ¾" conduit to exit equipment (20')
Valet Exit
Valet Enter
6 SM, 6 MM Fiber (~5000')
12 SM, 12 MM Fiber (~6000')
Copper through ¾" conduit to enter/exit equipment (50')
Economy Exit Comm Enclosure
Satellite Exit Comm Enclosure
Copper through ¾" conduit to enter/exit equipment (60')
6 MM Fiber (~1100')
6 MM Fiber (~2000')
Economy Plaza
Economy AVI Lanes
Satellite Plaza
Satellite AVI Enter

GARAGE A COMPUTER ROOM

The existing system head end is located in the Computer Room in Garage A next to the Exit Plaza.

Wall Rack

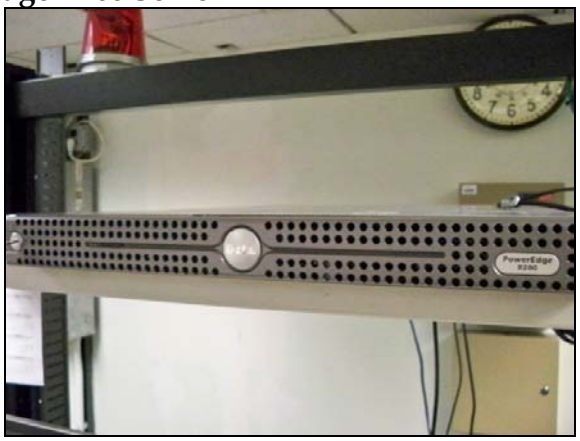
The picture shows the fiber patching for fiber from Garage BC, Economy, and Satellite lots. The Cisco switch shown in picture to right, is for Ethernet credit card function. Copper connections are for Garage A exit.

Fiber Terminations on Wall

Floor Cabinet

In the bottom portion of the floor cabinet is main PRCS controller (ISC 80). There is one also located in Garage BC, Economy, and Satellite Lot. At the top of the cabinet is an MWAA provided Cisco 3750 for admin workstation connection. The "Black Box" near top is for AVI control.

Existing SQL Server and New Dell PowerEdge R200 Server



Cisco 1700 and 1600

The devices above are for accessing the credit card payment system. There is a dedicated line provided.

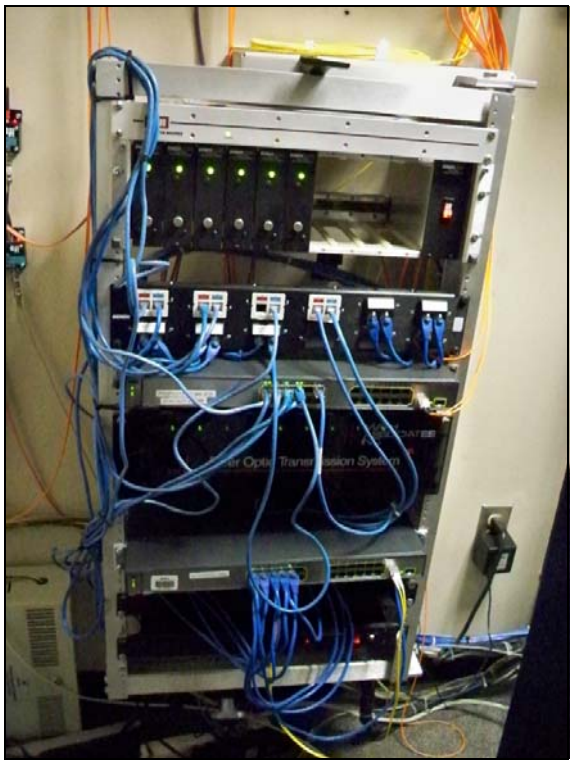
LPI Camera Recording (in Accounting Room)

The LPI cameras feed to this central point to Garage A. Cameras are recorded using antiquated VCR technology. There are a total of 15 LPI cameras. 2 are fed over coax (from Garage A exit) and the remaining 13 are transmitted over fiber.

GARAGE BC COMPUTER ROOM

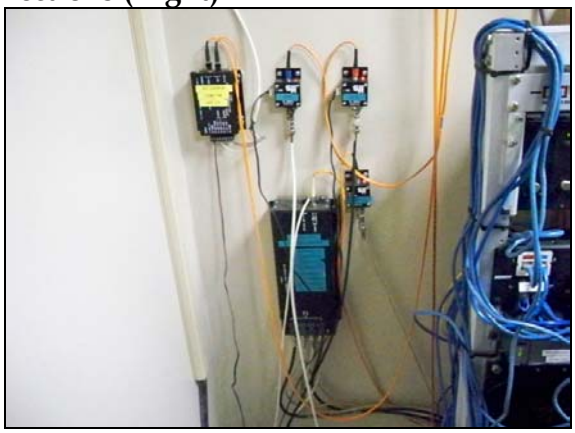
Garage BC also has a computer room. The room is located in the administrative facility next to the exit plaza.

Floor Cabinet and Wall Rack



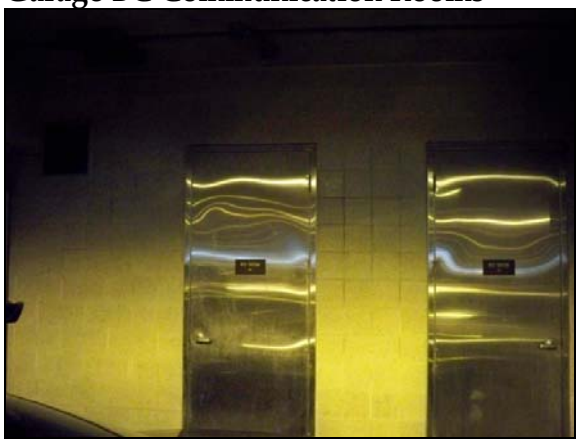
Floor cabinet has an ISC 80 controller. Wall rack has a network switch and patch panel for credit card functions.

Fiber Terminations (Left) and Camera Connections (Right)



COMMUNICATIONS ROOMS AND ENCLOSURES

Garage BC Communication Rooms



Each level (except for 5) of Garage BC has 2 small communication rooms (each one located adjacent to an electrical room). For each level, one room is located on B side and other is located on C side. The rooms are stacked vertically. The picture on the right shows the new room on Level 4 of Garage C.

Old Valet Communication Enclosure

This communication closure no longer has an ISC 80 controller installed. The enclosure includes:

- Small communication rack
- Space for PRCS Controller
- Air conditioner
- Power
- Fiber Terminations

Economy Lot Public Exit Communication Enclosure

The enclosure includes:

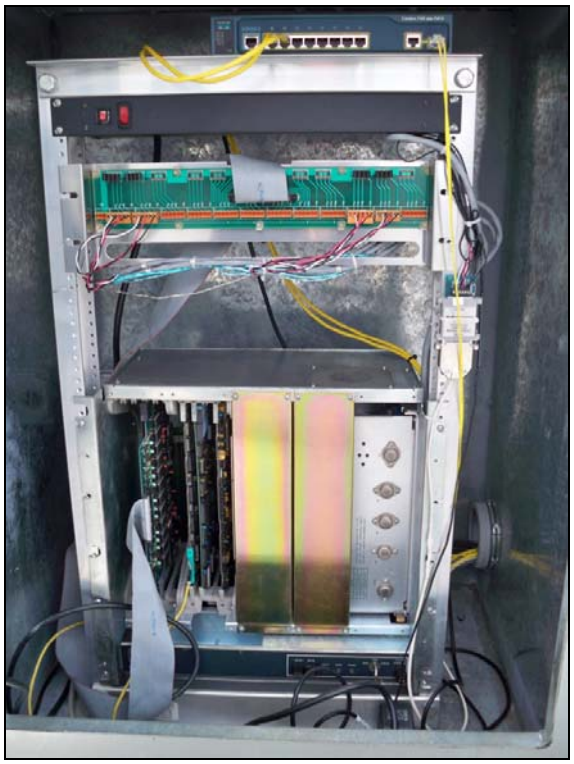
- 24 Port Network Switch for Credit Card services
- ISC 80 PRCS Controller
- Small communication rack on each side
- Fiber Terminations
- Air conditioner
- Power

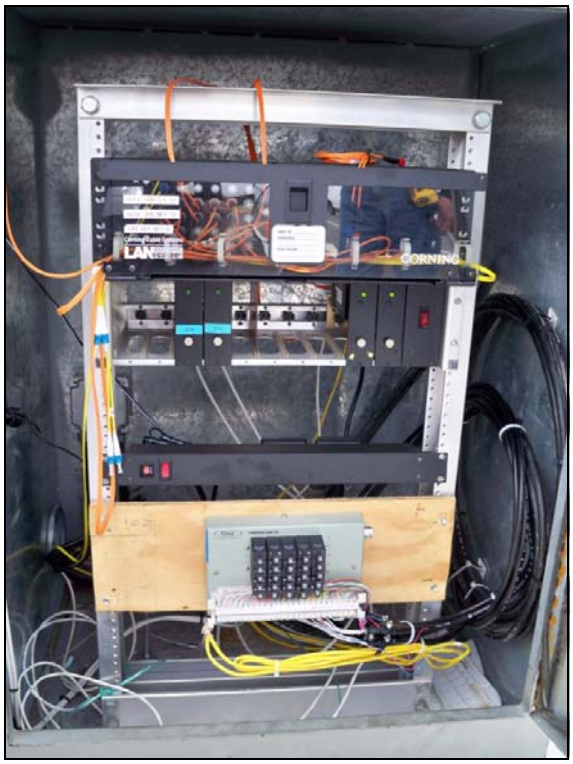
Economy Lot AVI Exit Communication Enclosure

The enclosure includes:

- 'Black Box' AVI controller
- ISC 80 PRCS Controller
- Fiber Terminations
- Power

Satellite Lot Main Plaza Communication Enclosure





The enclosure includes:

- 8 Port PoE Network Switch for Credit Card services
- ISC 80 PRCS Controller
- Small communication rack on each side
- Fiber Terminations
- Air conditioner
- Power

Cisco 3560 Switch

Helix Vehicle Count Loop Enclosures

Enclosure on left is flush mounted to ground and has 1-2″ of standing water in it. The enclosure on the right is mounted above the ground and has side vents to keep dry.

5.3. Appendix C: Interface Specification

Interface Name	PRCS - LPI
Systems	1. Parking Revenue Control System (PRCS) 2. License Plate Inventory System (LPI)
Description	The PRCS user has to perform a license plate search because (1) standard exit procedure, (2) a customer has lost his/her parking ticket or (3) a customer cannot find his / her car.
Inputs	Vehicle ID / License Plate Data 1. state 2. license plate number 3. status (active license plate)
Outputs	Standard Exit Transaction or Replacement / Exit Ticket Transaction 1. match to a unique ticket identifier 2. status (closed ticket and inactive license plate) Location of Lost Vehicle 1. status (active license plate) 2. garage 3. level 4. row 5. space number

Interface Name	PRCS - LPR
Systems	1. Parking Revenue Control System (PRCS) 2. License Plate Reader System (LPR)
Description	During the garage entry process, the LPR and PRCS systems will collect and store vehicle ID and garage entry data. This entry data will be used to match exit transactions and to resolve exit issues.
Inputs	Vehicle ID / License Plate Data image of license plate
Outputs	Garage Entry Data 1. unique ticket identifier 2. garage identifier 3. entry lane number 4. entry date and time Vehicle ID / License Plate Data 1. state (if good image) / (if bad image) state placeholder 2. license plate number (if good image) / (if bad image) unique placeholder 3. status (active)

Interface Name	PRCS – SPACE MGT
Systems	1. Parking Revenue Control System (PRCS) 2. Space Management System (SPACE MGT)
Description	The customer will rely on real-time signs displaying the number of available spaces determined by the SPACE MGT system. The parking operator will utilize the SPACE MGT and PRCS system to monitor the availability of parking spaces and manage/reconcile daily revenue collections.
Inputs	Vehicle Entry / Exit Movements captured by SPACE MGT sensors. 1. vehicle entry movement (available spaces is decreased by 1) 2. vehicle exit movement (available spaces is increased by 1)
Outputs	Parking Space Availability Data 1. status of all lots including space use/available counts 2. operating status of all sensors 3. operating status of all displays 4. display of summary statistics of parking space availability by specified date/time period 5. daily maximum and minimum counts for each parking level or entire facility 6. hourly flowrates through entries and exits

Interface Name	PRCS - MPS
Systems	1. Parking Revenue Control Systems (PRCS) 2. Mobile Payment System (MPS)
Description	Customer pays for DCA parking with a mobile device, gets a receipt, and exits the parking garage.
Inputs	Customer Parking Ticket 1. unique ticket identifier Customer Credit Card 1. card #, expiration date
Outputs	Customer Receipt 1. The airport's name, the airport customer service number, the airport address, and the parking facility's designation 2. consecutive, five-digit transaction number (00000 to 99999) 3. transaction amount up to $9,999.99 4. code for the transaction type (cash, credit card, insufficient funds, or non-revenue) 5. credit card type (e.g., Master Card, Visa, etc.) and last four digits of the card number 6. exit lane number 7. exit date and time 8. entry lane number 9. entry date and time

	10. code for the rate structure applied 11. payment type 12. license plate number and state

Interface Name	PRCS – EZ Pass
Systems	1. Parking Revenue Control Systems (PRCS) 2. Electronic Toll Paying System (EZ Pass)
Description	Customer pays for a DCA parking space via the EZ Pass transponder.
Inputs	EZ Pass Customer Account 1. account 2. beginning prepaid balance Parking Garage Fee Information 1. transaction amount up to $9,999.99 2. exit lane number 3. exit date and time 4. entry lane number 5. entry date and time 6. code for the rate structure applied 7. license plate number and state
Outputs	EZ Pass Customer Account via EZ Pass Statement 1. ending prepaid balance Customer Receipt via EZ Pass Statement 1. The airport's name, the airport customer service number, the airport address, and the parking facility's designation 2. consecutive, five-digit transaction number (00000 to 99999) 3. transaction amount up to $9,999.99 4. exit lane number 5. exit date and time 6. entry lane number 7. entry date and time 8. code for the rate structure applied 9. payment type 10. license plate number and state

Interface Name	PRCS – RESERVE
Systems	1. Parking Revenue Control Systems (PRCS) 2. Parking Reservations Systems (RESERVE)
Description	Customer reserves and pays for a DCA parking space through a website.
Inputs	Customer Account & Credit Card Information 1. account & password 2. card #, expiration date

	Parking Space Requested by the Customer 1. request entry date and time 2. request exit date and time 3. garage 4. level 5. row 6. parking space number
Outputs	Map of Parking Spaces Available 1. available entry date and time 2. available exit date and time 3. garage 4. level 5. row 6. parking space number Parking Garage Entry / Exit Ticket (via barcode) 1. Confirmation Number 2. Name 3. reserved / allowed entry date and time 4. reserved / allowed exit date and time 5. garage 6. level 7. row 8. parking space number Customer Receipt 1. The airport's name, the airport customer service number, the airport address, and the parking facility's designation 2. consecutive, five-digit transaction number (00000 to 99999) 3. transaction amount up to $9,999.99 4. code for the transaction type (cash, credit card, insufficient funds, or non-revenue) 5. credit card type (e.g., Master Card, Visa, etc.) and last four digits of the card number 6. code for the rate structure applied Loyalty Reward Program 1. reward points earned by reservation 2. reward balance

Assumptions

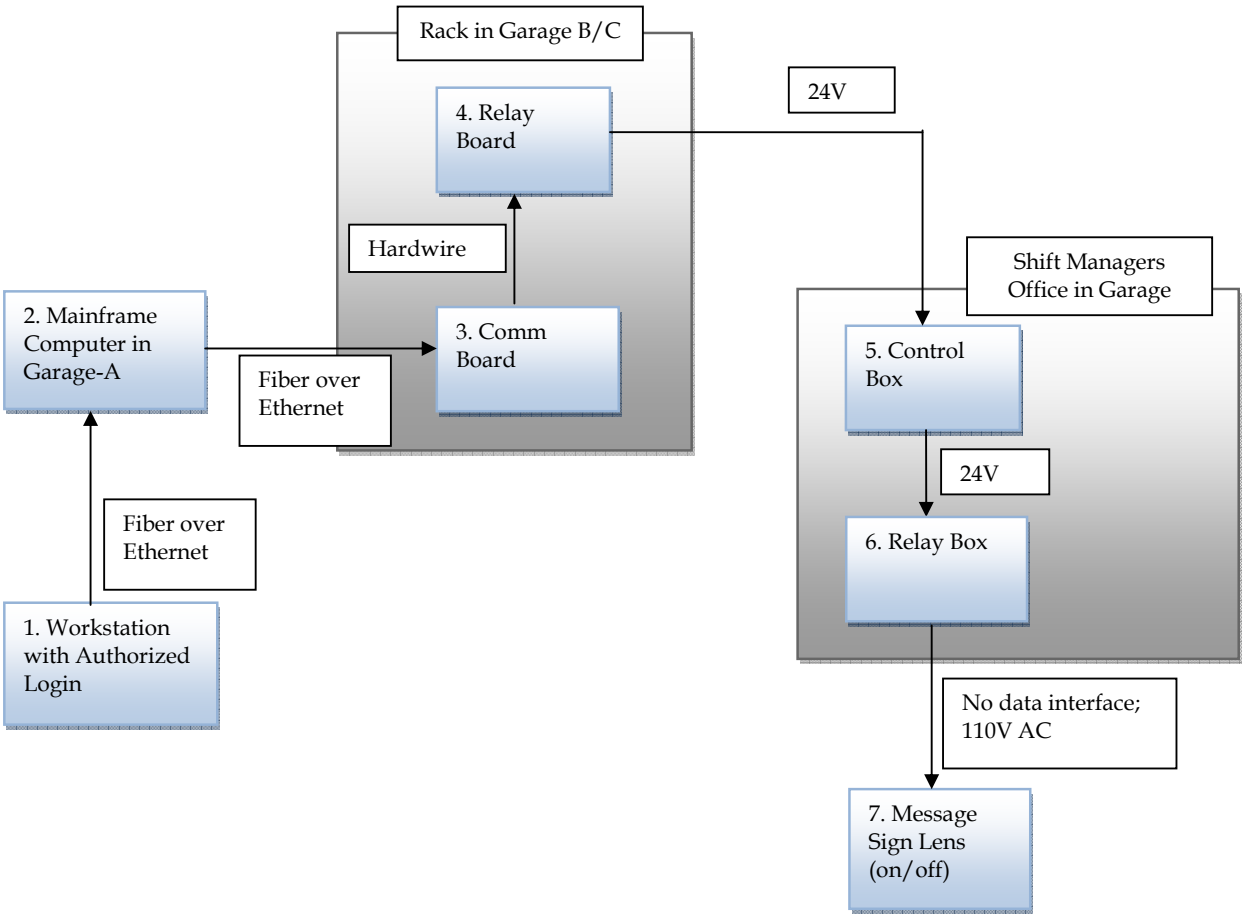
If the interface / link between the Parking Revenue Control System (PRCS) and one of the below systems is dropped, PRCS should still be able to process parking garage transactions. The ability to function independently, if needed, is critical because any downtime of the PRCS could quickly produce bottlenecks and long queues in the garage.

5.4. Appendix D: Message Sign Interface Document

Message Sign Interface

- Signage is currently ten years old.
- Message sign messages are construction of fiber and use a lens to illuminate.
- The ADA signage are LED signs and are manually controlled.
- Shielded cables are 24V DC.
- Wiring – The message sign wiring is as shown below with the main signage wiring coming into the computer room in the shift supervisor's office in Garage B/C.

Schema of Message Sign Interface



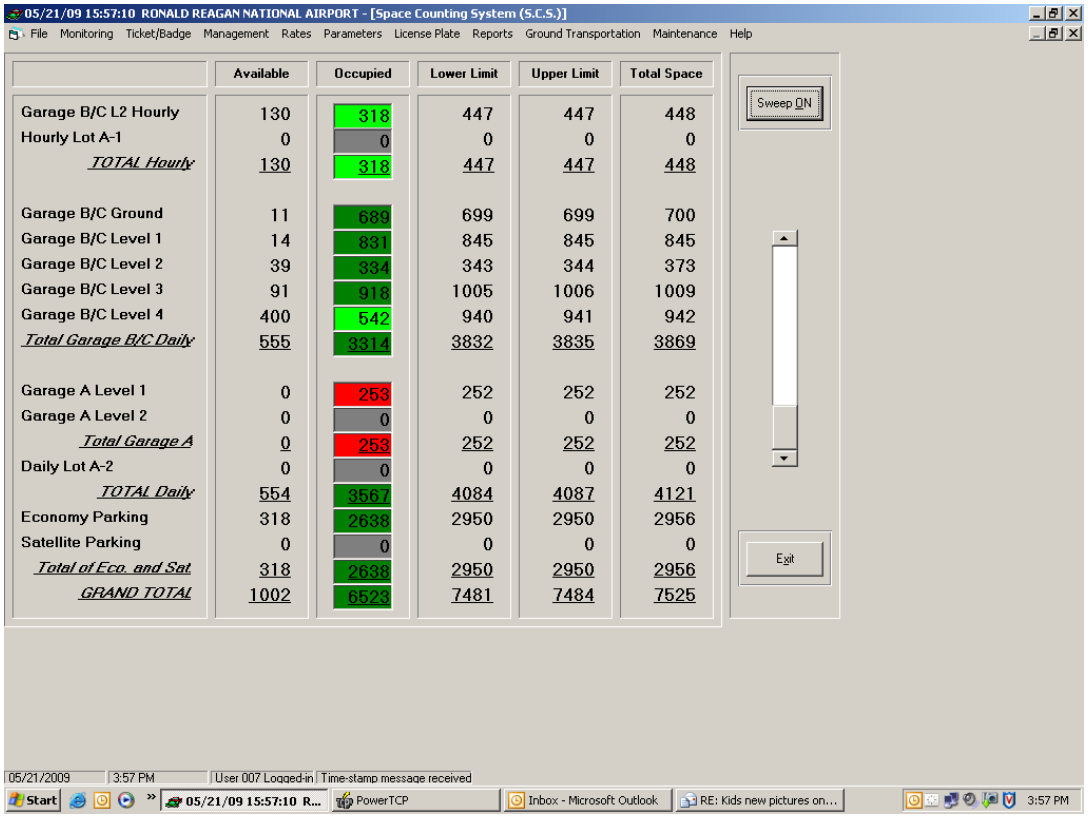
1. Workstations – Workstations are located as shown below. Garage 'Full' / 'Open' control requires authorized login.

Location	No. of Workstations	Users
Garage A	12	Parking Supervisors and Shift Managers
Garage B/C	4	Front Office staff
Airport Operations	1	General Manager
Terminal A	4	Auditing/Accounting

2. Garage Mainframe Computer
3. Communication (Comms) Board
4. Relay Board
5. Control Box – options are:
   a. Off
   b. Auto
   c. Hand (Manual)
6. Relay Box
7. Message Signs – options are:
   a. Full
   b. Open

Site Pictures and Additional Information

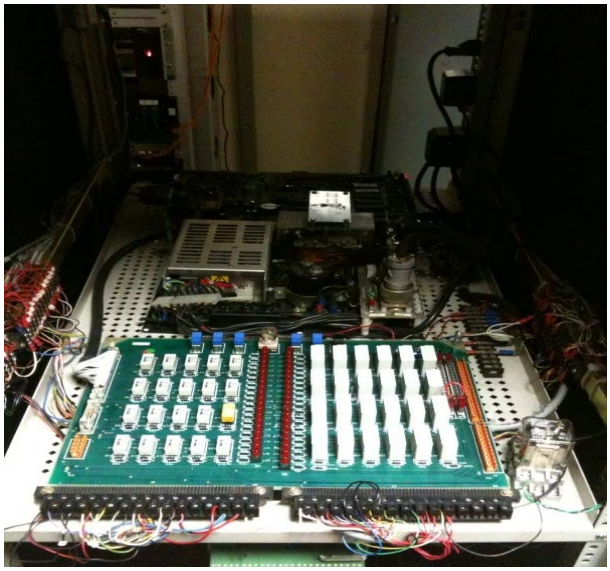
1. Workstation Space Count System Display


05/21/09 15:57:10 RONALD REAGAN NATIONAL AIRPORT - [Space Counting System (S.C.S.)]
File Monitoring Ticket/Badge Management Rates Parameters License Plate Reports Ground Transportation Maintenance Help
Sweep ON
Exit
05/21/2009 3:57 PM User 007 Logged-in Time-stamp message received
Start 05/21/09 15:57:10 R... PowerTCP Inbox - Microsoft Outlook RE: Kids new pictures on... 3:57 PM

	Available	Occupied	Lower Limit	Upper Limit	Total Space
Garage B/C L2 Hourly	130	318	447	447	448
Hourly Lot A-1	0	0	0	0	0
TOTAL Hourly	130	318	447	447	448
Garage B/C Ground	11	689	699	699	700
Garage B/C Level 1	14	831	845	845	845
Garage B/C Level 2	39	334	343	344	373
Garage B/C Level 3	91	918	1005	1006	1009
Garage B/C Level 4	400	542	940	941	942
Total Garage B/C Daily	555	3314	3832	3835	3869
Garage A Level 1	0	253	252	252	252
Garage A Level 2	0	0	0	0	0
Total Garage A	0	253	252	252	252
Daily Lot A-2	0	0	0	0	0
TOTAL Daily	554	3567	4084	4087	4121
Economy Parking	318	2638	2950	2950	2956
Satellite Parking	0	0	0	0	0
Total of Eco. and Sat	318	2638	2950	2950	2956
GRAND TOTAL	1002	6523	7481	7484	7525

2. Relay Board

2b. Relay board (close up)

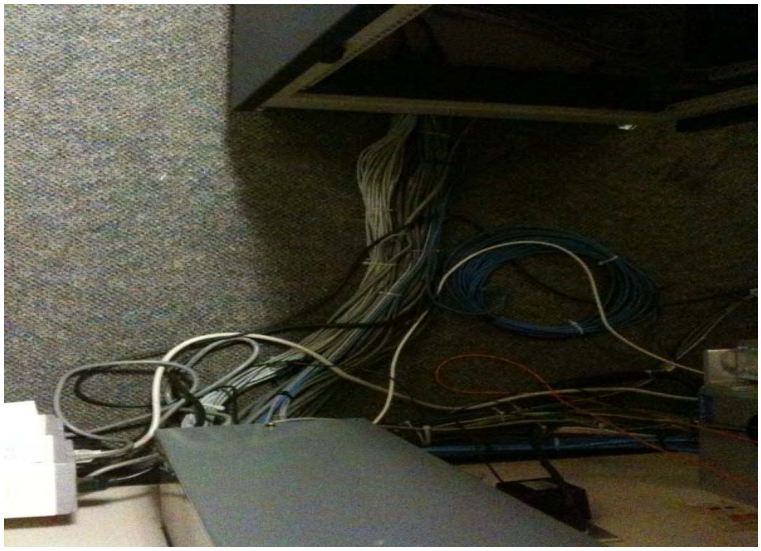


3. Control Box

a. Full view

b. Close up

4. Shielded Cables



5. Signage Cabling

5.5. Appendix E: Automated Vehicle Identification (AVI) Interface Document

SECTION 1
INTRODUCTION

SYSTEM OVERVIEW

PURPOSE

The Metropolitan Washington Airports Authority (the "Authority" or "MWAA") would like to implement a fully functional Automatic Vehicle Identification (AVI) Payment System to be used as a means of payment processing at MWAA's parking facilities in addition to other more standard methods. The system will need to be installed at Washington Reagan National Airport ("DCA") and will need to be compatible with the E-ZPass Plus as defined by the E-ZPass Interagency Group (IAG) system.

The purpose of this document is to convey MWAA's high-level requirements for the specific design, fabrication, provision, installation, integration, testing, acceptance, and maintenance of the AVI Payment aspects of a new Parking Revenue and Control System (PRCS). This provided information will serve as part of the information base for PRCS Offerors to provide a technical, cost and schedule proposal.

DOCUMENT OVERVIEW

This Functional Specifications document is organized as follows:

A. An introduction to the *Functional Specifications* is provided in *Section 1: Introduction* (this section).

B. An overview of the AVI Payment System is provided in *Section 2: System Overview*.

C. System requirements for the AVI Payment System are provided in *Section 3: System Requirements.*

SECTION 2
SYSTEM OVERVIEW

SYSTEM OVERVIEW

This section provides an overview of the AVI aspects of the Payment System. System objectives, a system concept, and system functions are provided. The system concept presented here shall be further refined and finalized by the Contractor during the development of detailed system requirements. The Contractor's detailed system design shall be subject to MWAA review and approval. The Contractor shall design, furnish, install, integrate and test a system in accordance with this concept and that meets or exceeds the system objectives and functions specified herein.

SYSTEM OBJECTIVES

A. The primary goal of including AVI as a Payment System is to provide a faster and more convenient payment method.

B. The primary objective of the AVI aspects of the parking Payment System at DCA is to allow customers to be able to use E-ZPass electronic transponders and associated account to pay for parking use.

SYSTEM CONCEPT

A. The AVI Payment System shall include equipment and software that shall cover both field equipment and a central system. The central system shall exchange information with the existing Virginia Department of Transportation (VDOT) E-ZPass Customer Service Center (CSC) in order to process E-ZPass transactions.

B. The AVI Payment System shall be compliant with FCC and FAA standards and shall not interfere with and shall not be interfered by any frequencies used for air traffic control, navigation, aviation communications, or other airport-based functions. Any other pertinent federal, state, industry, or MWAA regulations shall also be met.

C. The Offeror shall ensure that the AVI Payment System is consistent with PCI requirements.

D. Field equipment and central system components associated with this system include:

   a. AVI reader systems covering all designated and guard lanes at both the entry and exit points of MWAA parking facilities. The deployment shall provide AVI payment options at all of the DCA parking entry and exit lanes, including those in Daily and Hourly Garages A, B, C, and Economy Parking;

   b. AVI (E-ZPass Plus) central payment processing and file handling capability including an interface to the E-ZPass customer service center;

   c. A Patron Feedback Device (PFD) at the parking facility Entry and Exit Lanes in order to inform customers that the gate was opened due to a successful, E-ZPass transaction being recorded. This PFD shall be designed by the Offeror as best fitting MWAAs needs and could be a light box, LCD panel, or some other suitable device;

   d. As an MWAA selectable option, Variable Message Signs (VMS) located at designated parking entrance and exit lanes to display payment type accepted at lane and other pertinent messages; and

   e. Lane-side computing capabilities at all entry and exit lanes. These capabilities are necessary in order to implement E-ZPass, largely due to the fact that each lane needs to have rapid access to tag status files. Lane-side computing capabilities will likely need to be

implemented in the form of Lane PCs, which is assumed in these specifications, but the Offeror may propose other methods of satisfying these capabilities.

f. Potentially, additional loop or other vehicle detectors necessary to implement the system.

E. Proper lane functionality, payment processing, reporting, system support and maintenance, and system administration functions shall be implemented. These functions are further detailed below, in *Section 2.3: System Functions*.

SYSTEM FUNCTIONS

Lane Functionality

The AVI Payment System will have three associated lane types: one entry lane type and two exit lanes types. The exit lanes will be either fully automatic or both automatic and manually staffed (i.e. "AVI-Manual").

E-ZPass shall be installed at Parking Garage A, B, C, and the Economy Lot. The schematic plaza layouts are shown in the figures below. The figures below help to portray several AVI configuration issues that will need to be addressed during system implementation. The Offeror's design shall address the investigation and development of mitigation for these issues as follows:

A. For Garage B and C and the Economy Lot, there are some parking slots that are close to the entry or exit lanes. Cars with E-ZPass transponders parked in those spots could potentially be within the RF zone of the active lanes. This would cause such transponders to lose their battery life very rapidly.

B. In the case of Parking Garage A Exit, the lanes are staggered. There are also several entry lanes are staggered or angled. This geometry may impact the ability of the system to correctly sequence vehicles through the lanes and correlate LPR data with transponder reads or could result in incorrect lane assignment for a transponder depending on the physical configuration.

C. The antennae shall be configured, positioned and angled properly to minimize the chances of an early or late read that could cause a transponder to be assigned to the wrong vehicle or incorrect customer feedback (gate raise or ticket button enabled) to be given. Power levels can also be modified on the antennae to minimize these issues.

D. The Offferor shall clearly identify any recommended lane geometry modifications required to mitigate the above issues.

Figure 1 - DCA Parking Garage A Entry (2 lanes)

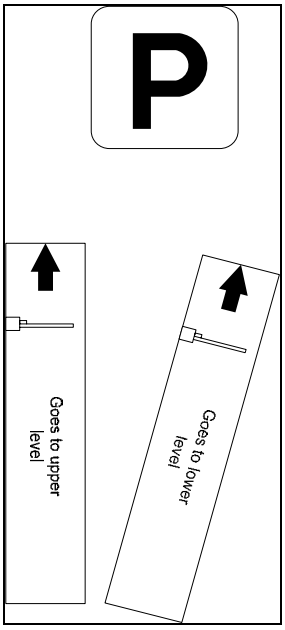


Figure 2 - DCA Parking Garage A Exit (3 lanes plus 1 rental car lane)

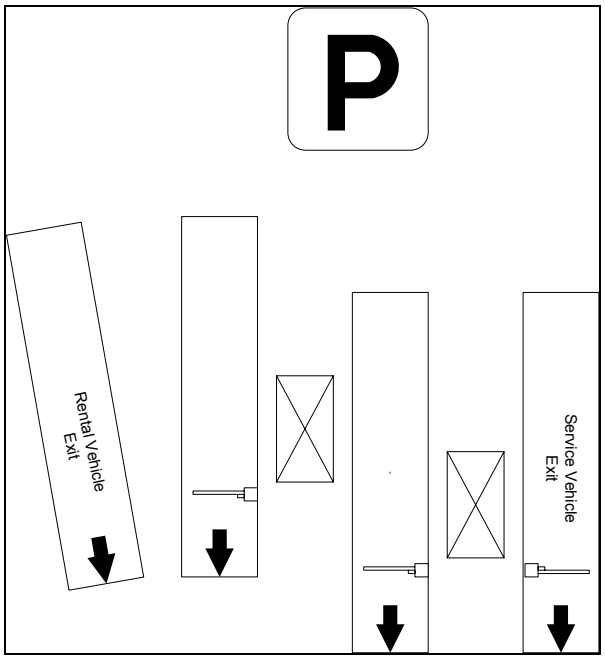


Figure 3 - DCA Parking Garage B Daily Ground Level Entry (2 lanes)

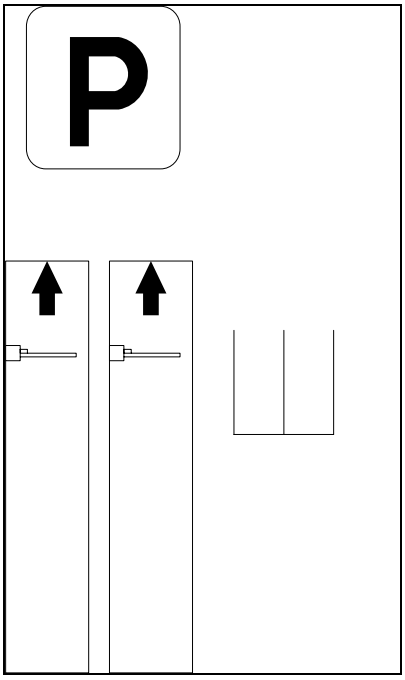


Figure 4 - DCA Parking Garage B Daily Level 1 Entry (2 lanes)

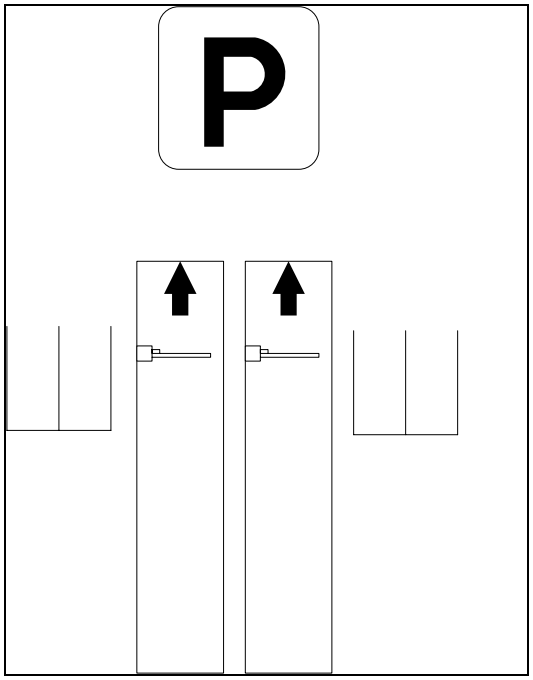


Figure 5 - DCA Parking Garage C Daily Entry (2 lanes)

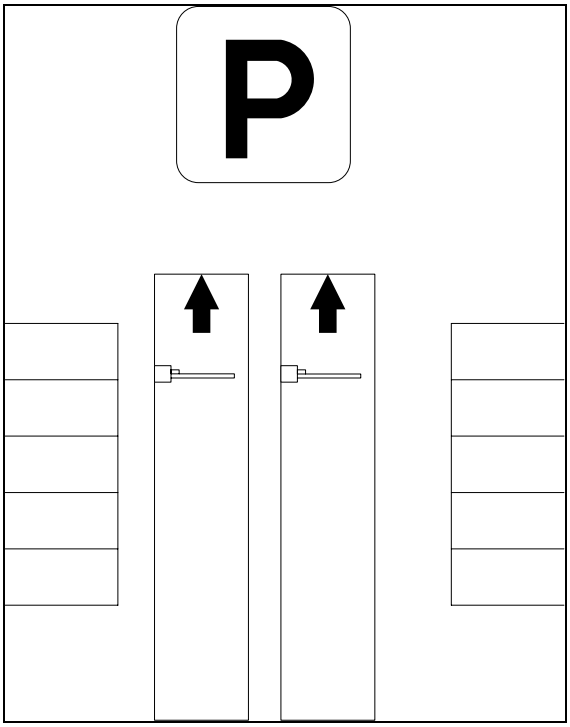


Figure 6 - DCA Parking Garage B-C Hourly Entry (2 lanes)

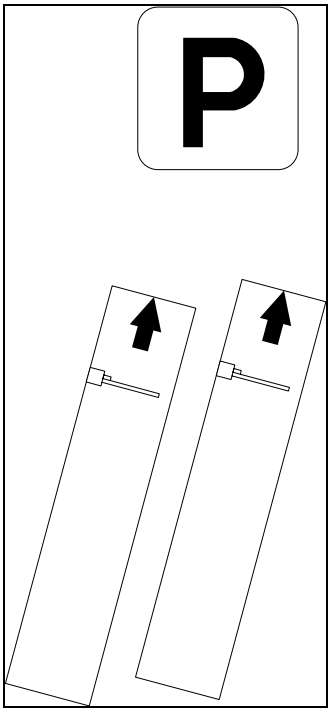


Figure 7 - DCA Parking Garage B-C Exit (10 lanes)

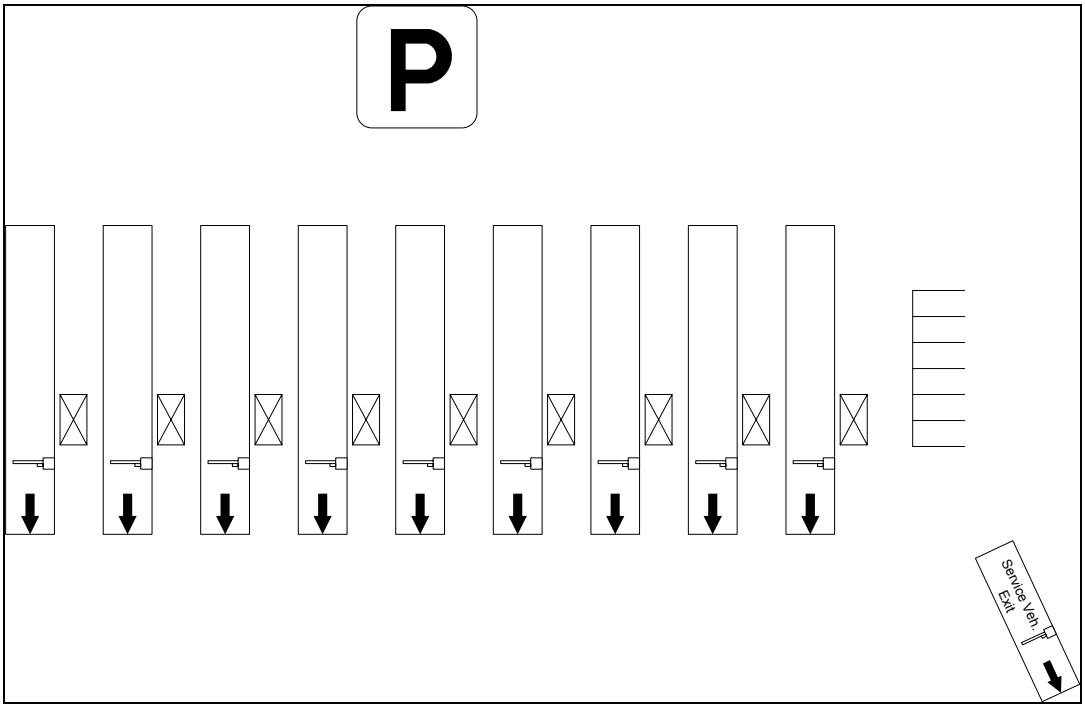
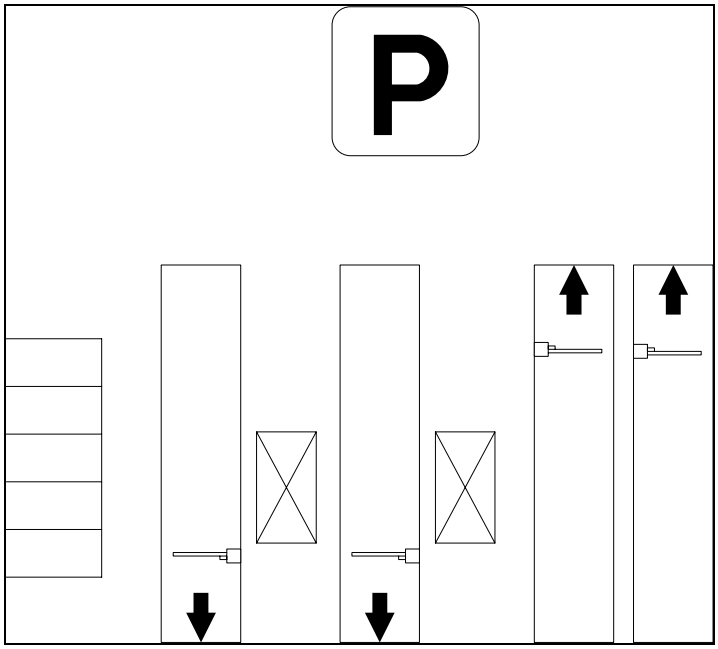


Figure 8 - DCA Economy Parking (2 entry lanes and 2 exit lanes)



All of the lanes at DCA shall be equipped to handle AVI transactions, including:

- Parking Garage A: All entry lanes and exit lanes
- Parking Garage B: All entry lanes and exit lanes
- Parking Garage C: All entry lanes and exit lanes
- Economy Parking Lot: All entry lanes and exit lanes

Each designated lane with AVI functionality shall have E-ZPass Plus tag status files transmitted to their Lane PC's. The central system will receive tag status files from the E-ZPass CSC. After that, these files will

be distributed to each lane PC associated with designated AVI-equipped lanes. Lane PC's will each send an acknowledgement file to the central system for successful reception of the file. The Offeror shall describe exact methodology for enabling such delivery, validation and reporting of file delivery in their proposal.

Each lane type will also have unique technical and operational business rules that will need to be followed. The diagrams in the following paragraphs propose such rules for each of these three lanes.

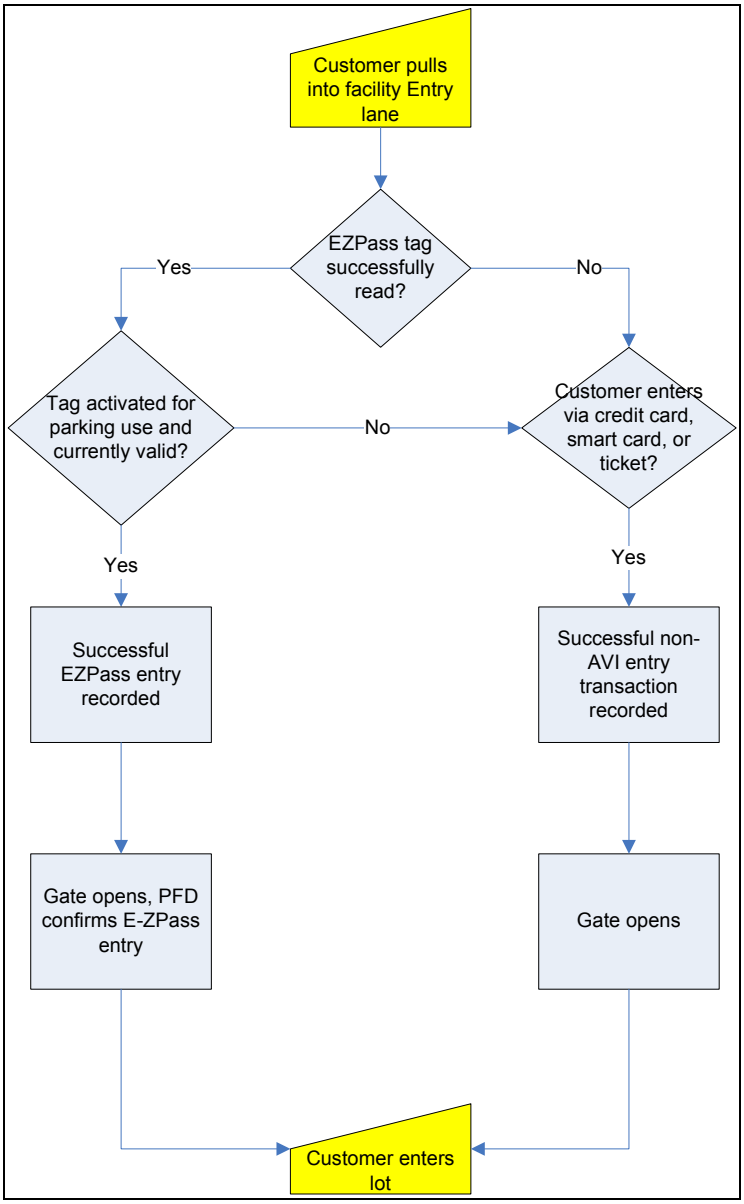
AVI Entry Lane

The AVI equipped Entry Lane shall be able to validate transponders and create entry transactions for validated vehicles. The Entry lane shall provide this functionality in both on- and off-line situations. In order to achieve this, the Entry Lane shall be able to receive a current tag status file from the central system.

For entry AVI transactions an entering vehicle's tag will be read by a Mark IV antenna at the lane. The tag number shall be processed by the reader and sent to a corresponding lane PC. The lane PC shall then validate the tag ID against the tag status file to identify eligibility for vehicle entry via the E-ZPass tag. If the tag ID is found to be valid, the PFD will indicate to the customer that the gate opened as a result of a successful E-ZPass entry transaction being created. The lane PC shall associate the tag ID with transaction information and LPR data and transfer the entry transaction details to the central system.

The Entry Lane shall also have the normal ticket, credit card, and smart card entry capabilities as applicable which shall be active if a valid tag is not read. With the addition of the AVI entry method, the lane logic will be slightly more complex. The diagram below shows a proposed logic to be followed in the Entry Lane with regard to AVI transactions. This logic is subject to review and finalization during the detailed design phase of this work.

Figure 9 –AVI Entry Lane Logic



Automated AVI Exit Lane

The automated exit lane shall be able to process E-ZPass tag reads resulting in exit transactions for valid tags. The exit lane shall be able to process transactions in both on- and off-line situations although processing will differ in each situation. In order to achieve this, the exit lane shall be able to receive and store a current tag status file from the central system.

For exit AVI transactions, an antenna at the exit lane will read a customer's tag and transfer the tag ID via the reader to the exit lane PC. At the lane PC, the tag ID shall be validated against the tag status file. If the tag is valid for E-ZPass Plus and a corresponding entry transaction can be found (or the lane is off-line), the lane PC shall generate the data to allow an exit E-ZPass transaction to be created. The creation of a successful E-ZPass exit transaction shall be indicated to the patron via a multi-use display at the exit lanes. LPR data shall be used to audit the transaction and appropriate logic and review functionality shall be provided for situations where entry and exit LPR data do not match. The Offeror shall identify how these anomalies will be handled.

The system shall support location of entry transactions by tag ID or by LPR record if no matching entry tag ID is found (in this situation, a supervisor would be intervening). When the lane is on-line and an entry transaction is found, then the patron display shall show the amount of the transaction that will be charged to the E-ZPass account.

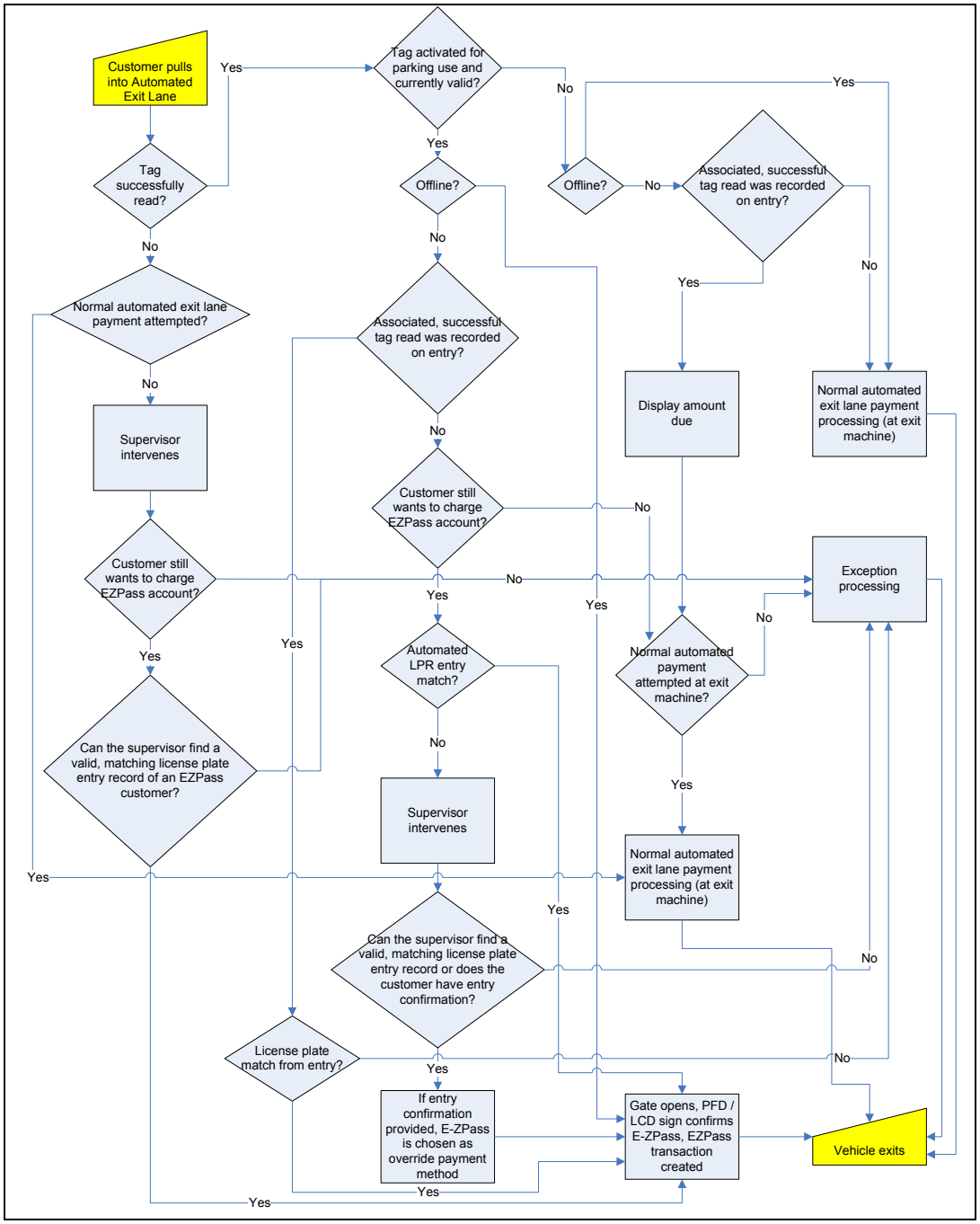
If the lane PC is off-line then the system shall match AVI exit transactions to entry transactions after the lane PC comes back on-line. This feature is discussed in the section covering central system functionality.

In addition the new E-ZPass payment method, customers shall be able to pay using other acceptable automated methods at an automated exit.

The proposed logic for an Automated Exit Lane is outlined in the flow chart below. This logic is subject to review and finalization during the detailed design phase of this work. The logic presented below includes several instances of Supervisor Intervention. The supervisor intervention optional functions shall be available to be used for both AVI and other payment types.

The proposed system shall also be able to handle other unusual conditions such as an E-ZPass transponder enters the exit lane, its transponder is read, but then it backs out and does not leave or goes to another lane.

Figure 10 – Automated AVI Exit Lane Logic


Customer pulls into Automated Exit Lane
Tag activated for parking use and currently valid?
Yes
No
Tag successfully read?
Offline?
Offline?
No
Associated, successful tag read was recorded on entry?
Yes
No
Normal automated exit lane payment attempted?
Associated, successful tag read was recorded on entry?
Display amount due
Normal automated exit lane payment processing (at exit machine)
Supervisor intervenes
Customer still wants to charge EZPass account?
Customer still wants to charge EZPass account?
Exception processing
Automated LPR entry match?
Normal automated payment attempted at exit machine?
Can the supervisor find a valid, matching license plate entry record of an EZPass customer?
Supervisor intervenes
Normal automated exit lane payment processing (at exit machine)
Can the supervisor find a valid, matching license plate entry record or does the customer have entry confirmation?
License plate match from entry?
If entry confirmation provided, E-ZPass is chosen as override payment method
Gate opens, PFD / LCD sign confirms E-ZPass, EZPass transaction created
Vehicle exits

AVI-Manual Exit Lane

The AVI-Manual Exit Lane processing is largely similar to that of the Automated AVI Exit lane and shall also be able to process E-ZPass tag reads resulting in exit transactions for valid tags. The exit lane shall be able to process transactions in both on- and off-line situations although processing will differ in each situation. In order to achieve this, the exit lane shall be able to receive and store current tag status file from the central system.

For exit AVI transactions, an antenna at the exit lane will read a customer's tag and transfer the tag ID via the reader to the exit lane PC. At the lane PC, the tag ID shall be validated against the tag status file. If the tag is valid for E-ZPass Plus and a corresponding entry transaction can be found (or the lane is off-line),

the payment terminal shall enable a “Pay by E-ZPass” button. If the operator selects this button, the lane PC shall generate the data to allow an exit E-ZPass transaction to be created. However, a customer shall be able choose to pay by accepted methods even if a valid E-ZPass tag is read. In this situation, the AVI entry data is used as the entry ticket data. Normal LPR data and processes shall be used to audit the transaction and appropriate logic and review functionality shall be provided for situations where entry and exit LPR data do not match. The Offeror shall identify how these anomalies will be handled.

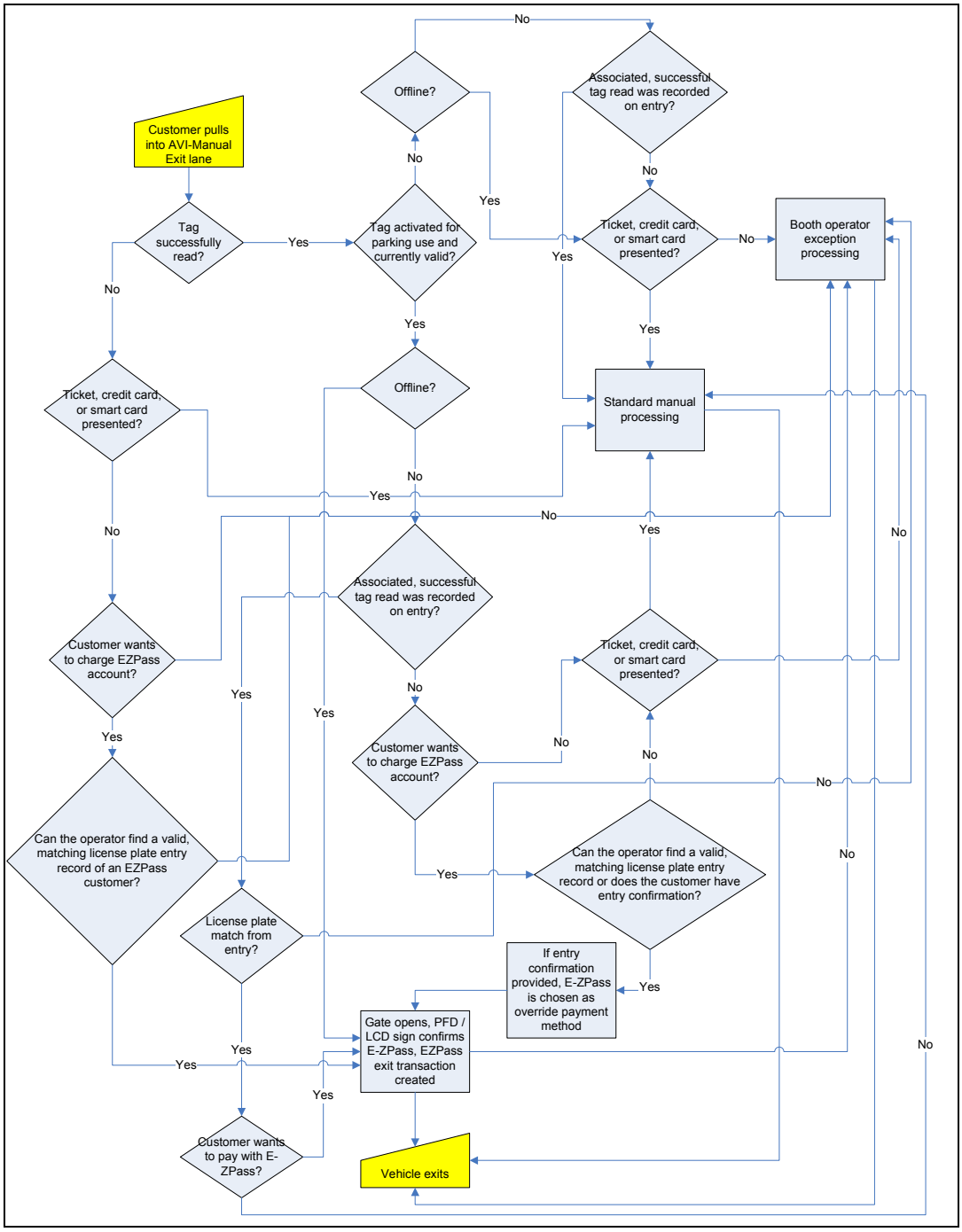
If the lane PC is off-line then AVI exit transactions must be matched to entry transactions after the lane PC comes back on-line. This feature is discussed in the section covering central system functionality.

The system shall support location of entry transaction by tag ID or by LPR record if no matching entry tag ID is found. When the lane is on-line and an entry transaction is found, then the patron display shall show the amount of the transaction that will be charged to the E-ZPass account.

In addition the new E-ZPass payment method, customers shall still be able to pay using a ticket, credit card, or smart card in a manual process.

The proposed lane logic for the AVI-Manual Exit lane is proposed as follows in the figure below. This logic is subject to review and finalization during the detailed design phase of this work.

Figure 11 – AVI-Manual Exit Lane Logic



Central / Payment Processing

A. The AVI Payment System shall communicate with the VDOT E-ZPass CSC to both upload and download data, according to the latest E-ZPass Facility Operator to Customer Service Center Interface File and Reporting Specifications (included in Appendix A). The basic data flows will be as follows:

a. For download, the system shall provide the capability to download tag status files from the CSC, containing a list of E-ZPass Plus transponders which can be used for parking payment and status information for each. After the central system receives these, it will distribute these files to each E-ZPass equipped lane.

b. For upload, the system shall provide a system capability to automatically upload successful E-ZPass Plus transaction files, which will include such data elements such as transponder number, transaction time, entry and exit location, and associated fee amount.

c. For reconciliation, the system shall download and process distribution files. The distribution file identifies how the transaction file received from the parking system has been broken down and distributed to away transponder agencies for payment (e.g. transaction for Maryland transponders is sent to the Maryland CSC for processing.) This CSC performs this distribution and provides a file summarizing the results for each transaction file received from the parking system.

d. For reconciliation, the system shall download and process reconciliation files. Several reconciliation files may be received for each transaction file as defined by the distribution files.

e. Upon receipt of a file, the system shall generate acknowledgement (ACK) files according to the IAG file specifications.

f. For uploaded files, the system shall download and process acknowledgement (ACK) files from the CSC.

B. The system shall distribute the received tag status files to the AVI equipped lanes as soon as they are received. A confirmed delivery method shall be used and the system shall be able to provide reports on when tag status files were delivered to the lane PCs.

C. The central system shall save tag status files for a configurable period of time and provide a method of searching for tag status in a particular file or on a particular day. This feature will be used for customer service research.

D. The AVI Payment System should allow a financial reconciliation capability between the VDOT E-ZPass CSC and MWAA. After MWAA uploads successful transaction files to the VDOT E-ZPass Customer Service Center, this center will collect revenue from its customers and other IAG agencies. VDOT will transfer necessary funds to MWAA's account under an agreed upon process. The system shall provide reporting and a user interface to allow tracking of the funds owed and the funds paid.

Reporting

A. The Offeror shall create E-ZPass specific reports to accommodate the new payment option.

B. Equipment and system status reports shall include information relating to the AVI reader systems and new central system components as necessary.

C. The Contractor shall obtain approval of all report formats from the Authority before delivery.

D. Typical AVI-related reports shall include, but are not limited to:

a. Periodic AVI transaction and revenue reports by location.

b. Periodic AVI transaction reports and revenue by tag agency.

c. Periodic AVI transaction file reports showing transaction and revenue totals and file status.

d. Periodic reconciliation summary and detail reports showing amounts reconciled, accepted and rejected with all E-ZPass agencies.

e. Outstanding reconciliation files reports showing un-reconciled transaction and distributed transaction files.

f. Periodic rejected transaction reports with grouping by tag ID and ability to filter to show only tags with greater than a configurable number of rejected transactions.

g. Tag status file distribution to lane PC report or GUI.

h. AVI anomaly summary and detail reports including tag entries without exit, LPR only matches of tag transactions at exit, unmatched AVI exit transactions.

E. The Offeror shall provide sample report formats as part of their proposal submittals.

System Administration/GUI

A. The system operator, supervisor and administrator GUIs necessary for AVI Payment System operation shall be incorporated into the overall system GUI. The reporting and configuration GUI for the central system interface to the E-ZPass CSC may be integrated with the rest of the system or may provided through a separate GUI.

B. The GUI shall allow system users to perform the following, on top of the other functionality:

a. Select or override the E-ZPass payment method in on the payment terminal at manual exits.

b. Provide for validation of entry transaction LPR data in real-time where system cannot generate a match.

c. Provide a user interface for confirming entry and exit data matches where exit was granted to a valid transponder while a lane was off-line.

d. Integrate AVI data into any exception processing functions as appropriate.

e. Access new AVI related reports

f. Monitor E-ZPass Plus customer activity at the lanes, including manual review of camera images and related transaction data.

g. Control lane signage if this option is exercised by the Authority.

h. Monitor and alert on AVI equipment status in a similar manner to the other system peripherals.

SECTION 3
SYSTEM REQUIREMENTS

SYSTEM REQUIREMENTS

This section identifies additional requirements for the system in regards to the field equipment and central system.

FIELD EQUIPMENT

AVI Reader Systems

A. In order to conform to IAG E-ZPass agreements, Mark IV AVI reader and antenna systems shall be utilized. The Offeror shall assume that they will be granted the necessary rights to use IAG member status to purchase equipment form Mark IV using IAG terms and conditions.

B. The AVI equipment shall consist of redundant Badger readers and corresponding lane kits sufficient to cover the desired entry and exit lanes as well as any necessary guard lanes. The AVI reader configuration shall support implementation at all parking entry and exit lanes at DCA.

Patron Feedback Device (PFD) [Note these requirements could be integrated with another device if one is to be installed as part of the new system]

A. The Contractor shall provide a PFD at each E-ZPass equipped lane in order to notify customers when their E-ZPass transponder has been successfully read and validated.

B. The PFD shall be able to display a single message such as “E-ZPass Accepted – Please Proceed.” The message shall be finalized during the detailed design stage.

C. The type of device to fulfill the PFD requirement shall be proposed and finalized by the Contractor with consideration for the system’s needs. Potential device types includes LCD and light box.

D. The Authority shall be able to alter the message displayed by replacing appropriate parts.

E. When not activated, the PFD shall appear as a blank display to prevent confusion to incoming patrons.

F. The PFD, when activated, shall be clearly visible during the day or night and shall not be impacted by sun glare.

G. Driver notification equipment design and installation shall minimize driver distraction and take safety considerations into account.

H. Where multiple vehicles are traveling close together, the driver notification equipment shall be designed and located to minimize confusion as to which vehicle the notification is being addressed.

Lane-side Computing Capabilities

A. The Contractor shall provide appropriate lane-side computing capabilities necessary to support the E-ZPass implementation.

B. The capabilities shall likely need to be fulfilled in the form of installing a lane PC at each DCA parking entry and exit lane. However, the Offeror may propose other configurations for MWAA’s consideration.

C. Lane-side computing hardware shall store the tag status file and recorded transaction files.

D. Lane-side computing hardware shall interact with the reader systems and be able to read outputs from these reader systems.

E. Lane-side processing shall rapidly match tag ID's that are read by the reader systems with current tag status files stored lane-side and be able to record transaction records.

Variable Message Signs (VMS) Option

MWAA wish to consider the option to install VMS signs above selected parking entrance and exit lanes to display information to customers such as the acceptable payment methods at each lane. The Offeror shall provide an option to include VMS for MWAA consideration in their submittals. The Offeror shall provide two alternatives for this option: control of VMS signs using a stand-alone and a fully integrated system. The Offeror should describe the design and pricing differences for each alternative.

The following summarize the requirements for the VMS:

A. The VMS and any required support infrastructure shall be designed, procured, furnished, installed, integrated, and tested by the Contractor.

B. The VMS shall be connected to the lane PC for control.

C. The VMS shall display acceptable payment methods by lane and other required information automatically. VMS displays should be updated, whenever needed, via a message sent through the system to reflect changes to the lane mode. The Contractor shall identify, as part of their design submittal, how to best display the necessary information on the signs.

D. The VMS shall be able to display system operator-input messages for general announcements.

E. The VMS shall be able to display alpha-numeric characters in a proportional font in a single color.

F. The VMS, when activated, shall be clearly visible during the day or night and shall not be impacted by sun glare. The front panel surface and the internal construction of the sign shall be design to minimize impact of sun glare.

G. The front panel surface shall be resistant to deterioration by UV light.

H. The VMS shall be built for 24 hours, 7 days per week operations with a minimum operational life of ten (10) years.

I. The VMS shall be a standard cataloged product, and shall be the manufacturer's latest standard design that complies with the specified requirements.

J. The VMS shall have a legibility distance of one hundred (100) feet. That is, all sign information shall be viewable at least one hundred (100) feet from the VMS. Characters shall be at least 12 inches in height.

K. The sign shall support at least 12 characters and support scrolling and cycling between messages.

L. The VMS shall be highly visible even in inclement weather conditions. The VMS shall have internal heaters to prevent icing.

M. The VMS and support structure shall meet or exceed the following requirements:

    a. Materials shall be new and corrosion resistant

    b. Proper drainage holes shall be provided to allow the escape of any moisture

    c. Temperature: -35 to 165° F

d. Humidity: 5% to 95%

N. The Contractor shall provide all cables and connectors for proper connection to the PRCS.

O. The Contractor shall provide all assemblies, mounting brackets, and appurtenances required to securely mount the VMS.

P. The Contractor is responsible for the final hook-up of power and communications to the VMS and retains overall responsibility for schedule and acceptance.

Additional Loop Detectors (option)

A. The Offeror shall determine whether additional loop or other vehicle detectors will be necessary in order to properly implement the E-ZPass Payment system. The Offeror shall identify the need for additional detectors in their proposal.

CENTRAL SYSTEM AVI SPECIFIC REQUIREMENTS

General

A. The Offeror shall assume that the interface to the E-ZPass CSC shall be provided via a TCP/IP connection over an Ethernet port physically accessible to the existing central system. The Offeror shall assume that the WAN connection to the CSC shall be provided by others.

B. The central system shall provide a single integrated system to manage and monitor the system including all payment types and entry.

C. The central system design, including all hardware, software, and interfaces, shall be submitted for MWAA's review and approval.

D. The system shall support roll backs and data recovery.

Central System Hardware

A. To support the E-ZPass payment operations at MWAA, the Offeror shall identify whether a stand-alone server will be installed or if this functionality will be combined with other system servers.

B. The Offeror shall include proposed server performance specifications and overall system architecture information in their response. All hardware specifications and equipment requirements shall then be explicitly identified by the Contractor as part of a design submittal and are subject to MWAA review and approval. MWAA shall then procure central system hardware that meets or exceeds these generic equipment requirements through already existing computer hardware contracts with Dell. The Contractor shall then be responsible for installing, integrating, and completing the system.

C. The central system hardware shall be configured to utilize the communications link with the E-ZPass CSC.

Central System Software

A. The Contractor shall provide central system software that is necessary to fully operate and maintain the AVI Payment System. The Contractor shall supply application software to configure all software programs for optimal performance of the central system and its associated networks.

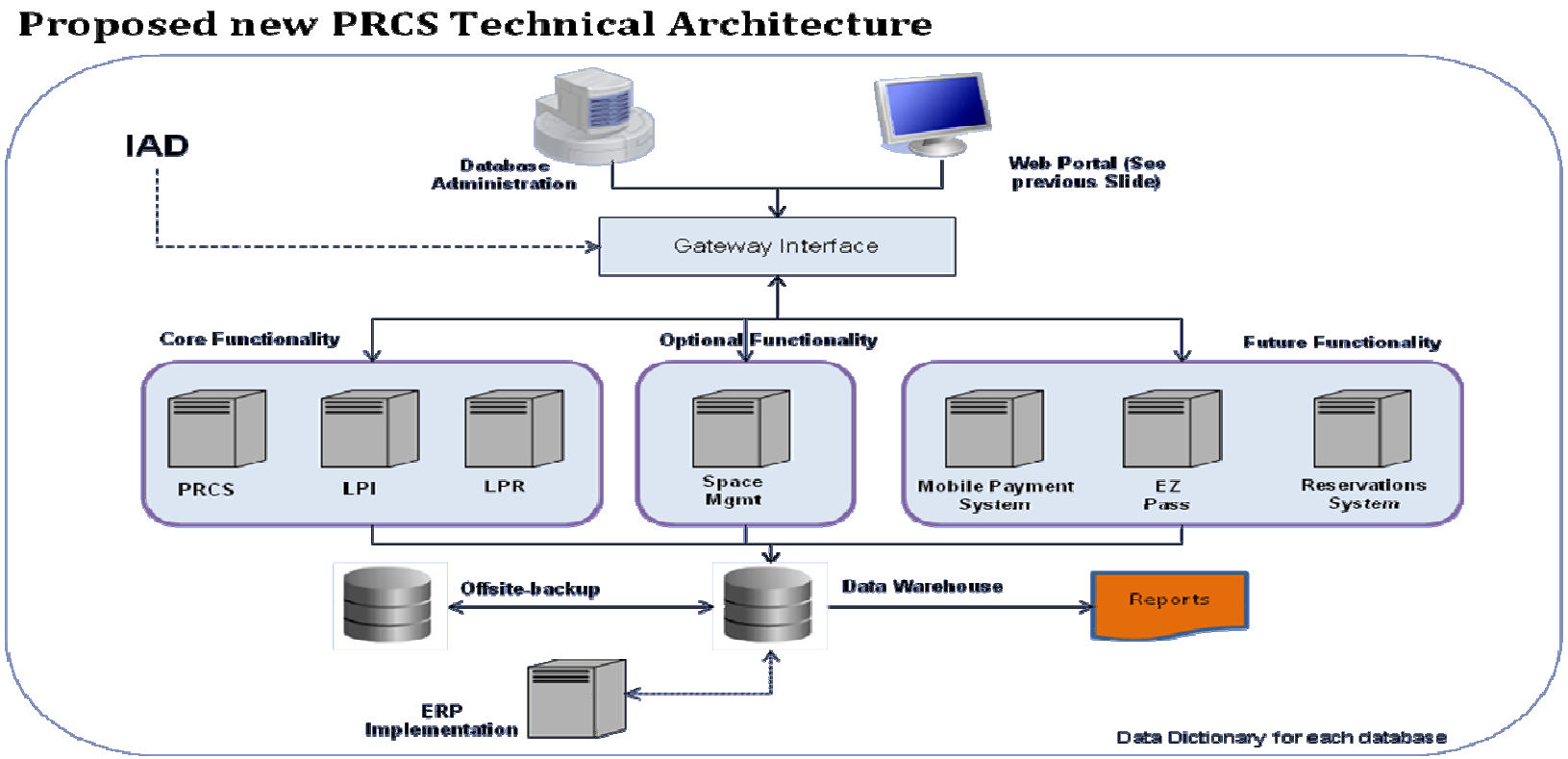
B. The software shall support system functions described in *Section 2.3: System Functions.*

Field Equipment Software

A. The Contractor shall provide software for the lane PCs that are necessary to fully operate and maintain the AVI Payment System as described in this these specifications. The Contractor shall supply application software to configure all software programs for optimal performance of the field equipment systems and its associated networks.

B. The software shall support system functions described in *Section 2.3: System Functions.*

5.6 APPENDIX F – PROPOSED HIGH-LEVEL ARCHITECTURE DIAGRAM



5.7. Appendix G : Contract Data Requirements List

CDRL	Submittal Description	Section	Required for:			
			CDR	PDR	FDR	Other
101	ADA Compliance Report	1.4	✓	✓	✓	
201	PRCS Administration Maintenance Manual	2.3.7				
202	Commercial Software Package List	2.3.9.1		✓	✓	
203	Camera Installation Plan	2.7.2.2/2.7.5.2			✓	
204	Lighting Code Requirements List	2.7.5.2			✓	
205	Source Code	2.7.6.1				System acceptance
206	Notice of Personnel Change Form	2.3.10				
207	Data Table Map	2.3.9				
301	Project Management Program Plan	3.1.2.2	✓	✓	✓	NTP + 5 days
302	Project Schedule	3.1.2.3				Monthly
303	Installation and Interface Plan	1.3/3.3.1.2		✓	✓	
304	Monthly Progress Reports	3.1.3.4				Monthly
305	PCRS Equipment Installation and Removal Details	3.1.3.3		✓	✓	15 days prior to equipment installation
306	First Article Configuration Inspection Plan	3.3.1.1			✓	30 days prior to FACI
307	Factory Acceptance Testing Reports	3.3.1.1			✓	15 days after conducted test
308	Failure Review Process	3.1.3.4			✓	30 days to prior to Acceptance Test start
309	System Acceptance Testing Plan	3.3.1.4			✓	30 days to prior to Acceptance Test start
310	Overall Inspection and Test Plan	3.3.1.5			✓	30 days prior to performance of first test
311	Detailed Inspection Plan and Sheets	3.3				30 days prior to FACI
312	Detailed Test Procedure	3.3.1.5			✓	30 days prior to performance of each test
313	Test Reports	3.3.1.5				Within 10 days after completion of each test
314	Training Materials	3.4			✓	60 days before classes are scheduled to begin
315	Training Program Plan	3.4.1.2			✓	
316	Training Schedule	3.4			✓	
317	Warranty Plan	3.5			✓	90 days prior to the start of any warranty period
318	Request for Design Qualification Waiver	8.3.1.2		✓	✓	
319	Consumable Items List	3.5.6				
320	Warranty Repair Agreement	3.5.9			✓	
321	Repair Reports	3.5.9.4				
322	Quality Assurance Program Plan	3.6.1				
323	Manuals Schedule	3.8				
324	Special Tools List	3.8.3.5			✓	
325	Maintenance Manuals	3.7.3.6				
326	Shop Maintenance Manual	3.7.3.6				

5.7. Appendix G : Contract Data Requirements List

CDRL	Submittal Description	Section	Required for:			
			CDR	PDR	FDR	Other
327	Integrated Wiring Diagrams	3.8.3.6		✓	✓	
328	Software User Manual	3.8.3.8				
329	Documentation List	3.8				
330	Conceptual Design Review Package	3.2.3	✓			
331	Preliminary Design Review Package	3.2.4		✓		
332	Final Design Review Package	3.2.5			✓	
333	Operation Instruction Manual	3.8.3.1				
334	Repair and Maintenance Manual	3.8.3.2				
335	Shop Maintenance Manual	3.8.3.3				
336	DTE and Special Tools Manual	3.8.3.5				
401	Preventive Maintenance Manual	4.2			✓	
402	Master Maintenance Plan	4.2.2				

5.8 APPENDIX H: EXISTING PRCS NETWORK INFRASTRUCTURE DIAGRAM